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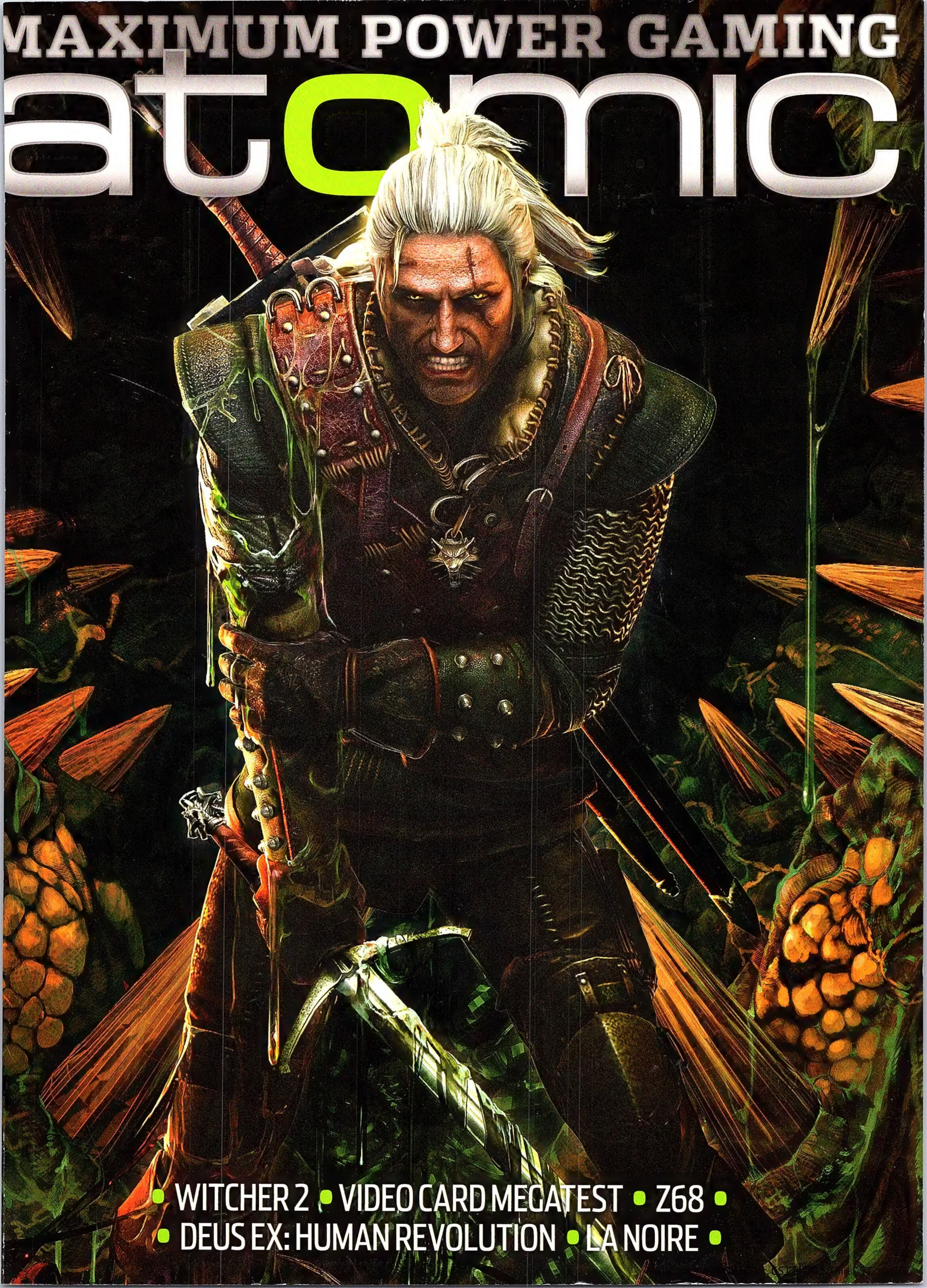

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EDHEAD

Big is relative

We've got one of our tiniest review sections in a while, this month. It's kind of cute, really – sitting there, all little and pretending to be a big, proper reviews section.

You just want to give it a hug.

The reason it's so tiny, though, is because we needed the room. We've got one of our biggest Head2Heads ever – 23 pages of intense graphics card testing that throws up some rather interesting results.

We're focusing on the modern range of cards, basically AMD's 6-series and Nvidia's 5-series. We include results from older cards, too, for comparison purposes. What that added up to was something like more than 700 benchmarking runs... whoa. That's a lot of data.

Of course, one of the issues with testing like this is that you end up with an ever-so slightly different set of results. In our prior, standalone testing AMD's cards have seemed the bomb, but tested in one go in our roundup, it's all in Nvidia flavour.

The difference is only a matter of single frames, so it's hard to make a serious judgement one way or the other – but it's looking good for the green giant.

That said... we're not ditching our AMD-driven system any time soon. It's not all about numbers, you know!

David Hollingworth
dhollingworth@atomicmpc.com.au
Twitter: @AtomicMPC
Facebook: AtomicMPC

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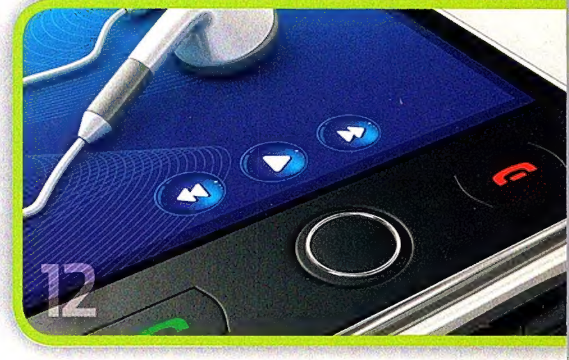
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editorial
editorial@atomicmpc.com.au
editor david hollingworth
deputy editor justin robinson
editorial assistant ewa grygier

design
art director david west
product photography jason busch
creative director sam grimmer

contributors: dan rutter, ashton mills, chris taylor, jake carrol, ben mansill, vito cassisi, Elvenwhore

production
group production manager angela sutherland
production manager ewa (mother) grygier
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gordon & gotch new zealand
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advertising + marketing
t+61 2 8399 3611 f+61 2 8399 3622
group advertising manager joanne nichols
jnichols@haymarketmedia.com.au

haymarket media
t+61 2 8399 3611 f+61 2 8399 3622
50 victoria street, mcmahons point
nsw 2060

managing director jeremy vaughan
commercial director darren mcnally
publishing manager phil vella

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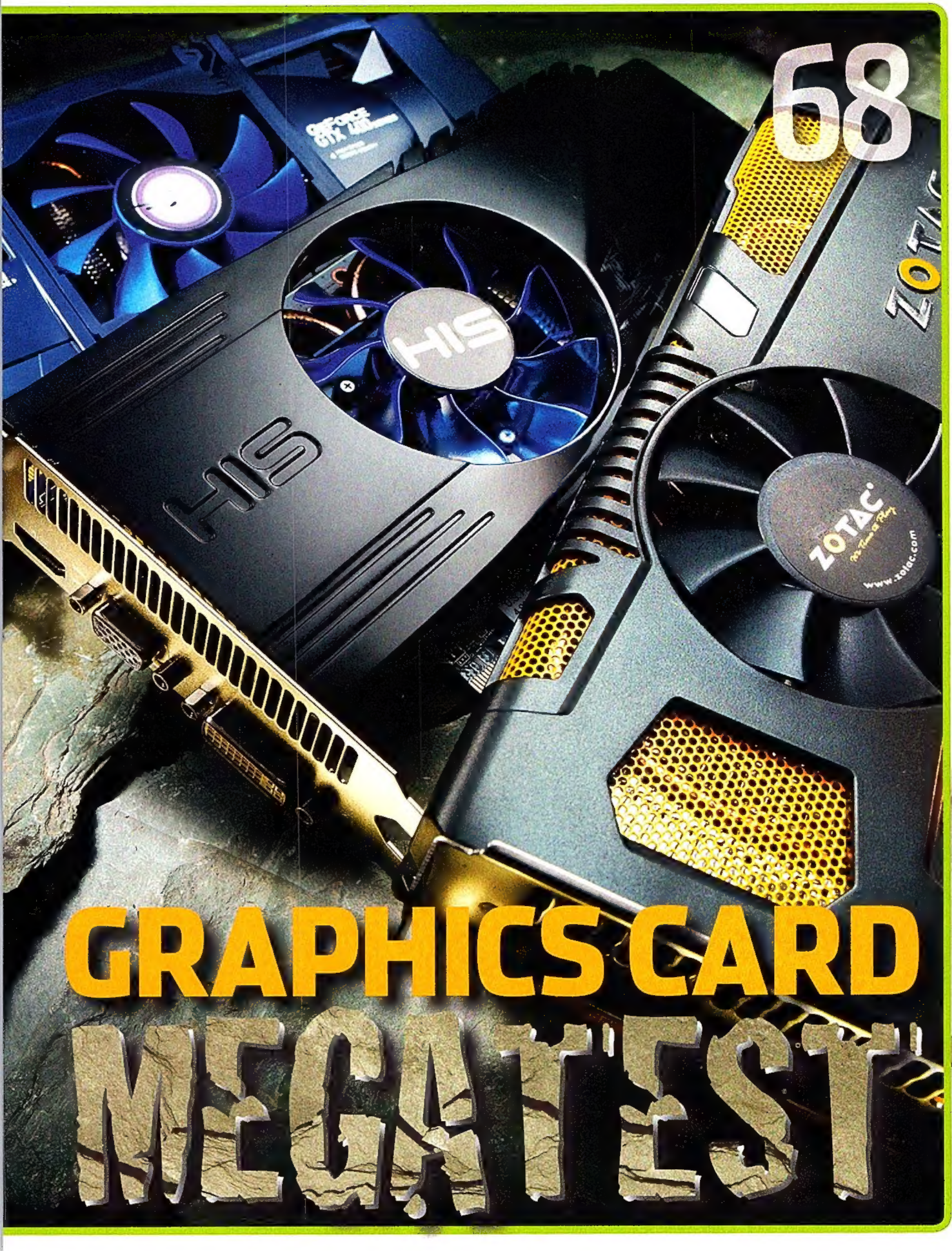

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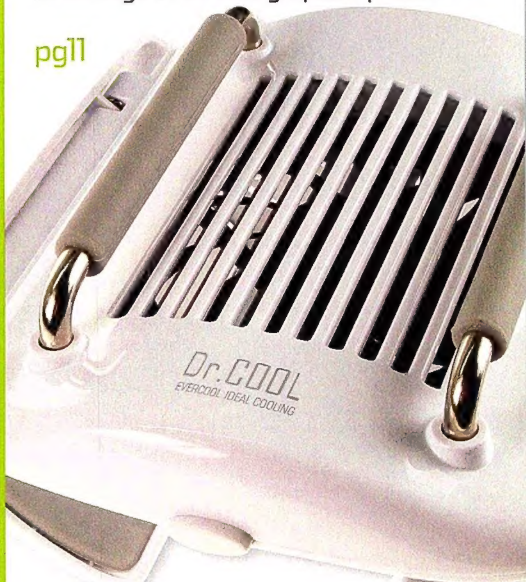

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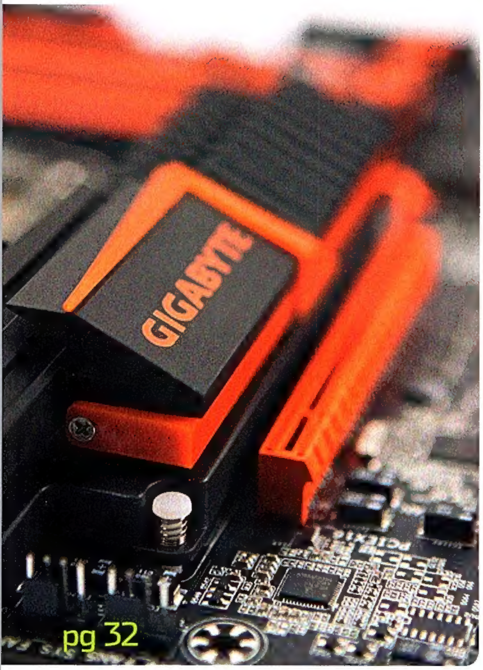

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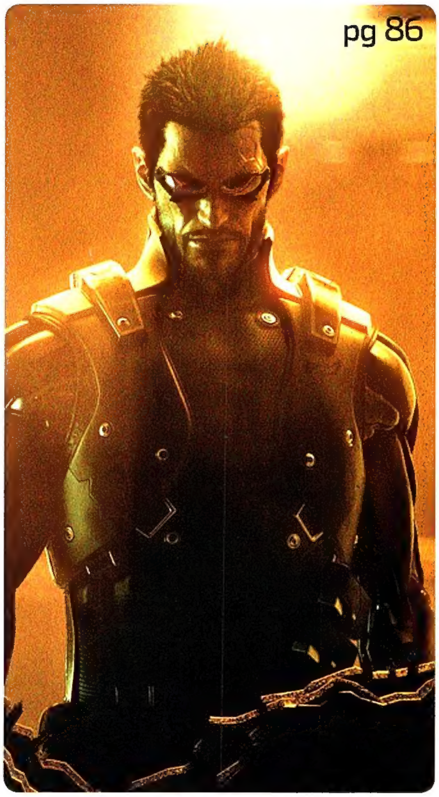

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R18+ draft guidelines released

MP Brendan O'Connor has released his draft guidelines to adopting an R18 rating – we've had a look, and it reads bloody well!

Brendan Connor, the Federal Minister for Justice, has finally released a draft guideline in support of introducing an R18 rating for games.

You can read the full draft on the Classification website (**http://www.classification.gov.au//www/cob/classification.nsf/Page/InformationCentre_ProposeddraftGuidelinesforR18+ComputerGames**) , but here are the salient points:

Classification categories

The Act names the classification categories for computer games, and the Code describes them.

The categories are:

- G
- PG
- M
- MA 15+
- R 18+
- RC

The Code

Under the Code, classification decisions are to give effect, as far as possible, to the following principles:

(a) adults should be able to read, hear, see and play what they want;

(b) minors should be protected from material likely to harm or disturb them;

(c) everyone should be protected from exposure to unsolicited material that they find offensive;

(d) the need to take account of community concerns about:

(i) depictions that condone or incite violence, particularly sexual violence; and

(ii) the portrayal of persons in a demeaning manner.

Interestingly, the breakdowns between what's allowable under a re-worked MA15 and R18, especially in terms of sex and violence, suggests that a game like LA Noire (which we wrote about on the site in terms of its classification) is most definitely worthy of an R18 rating.

This guide has been put together and distributed to Ministers ahead of a July meeting on the decision.

Australian gaming: healthy and happy?

A new report points to growth in the Australian gaming industry, but it's not all sparkles for those looking to make their way in...

Looking to get into the gaming industry, but think it's near impossible? Well – things may not be as dire as all that, if you've got the skills.

According to a recent study by the ARC Centre for Excellence for Creative Industries and Innovation at Queensland University of Technology, the Australian gaming sector is on the up. Spending on games is set to rise from $1.1 billion back in 2009 to $1.6 billion in 2014 .

And those figures should translate into jobs in the industry. According to the study, Working in Australia's Digital games Industry, 83 per cent of respondents 'believed that a skills shortage still exists, in spite of the recent downturn in the games industry caused by the global financial crisis.'

Of course, there are skills and there are skills. Disappointingly, perhaps, for all those currently enrolled in the games courses being offered by unis, tafes and private colleges, 84 per cent of those polled rated Australian games courses as 'highly ineffective', with the main complaint being that these courses are churning out graduates who are 'not industry ready'. D'oh!

The gaming industry itself is not blameless, with the report identifying the lack of a strong training and development culture and 'ad hoc, underdeveloped or not maintained links' between employers and those offering games development courses. The also study suggests a whole bunch of initiatives.

More can be found at this site (**http://www.cci.edu.au/content/games-industry-skills-project**) and makes for an interesting – if somewhat dry – read, whether you're currently in the industry or not.

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FROM ATOMIC ONLINE

You know what I like? I like popping the cork on a fine bottle of scotch - you know, a real one, with an actual cork. That first aroma of the whiskey, all full of peat and organic tones, then the swirl of brown liquor as you pour it over ice... man, that sound, ice on glass through three fingers of golden brown scotch is one of the most alluring sounds ever.

Oh, and I also dig on POST OF THE MONTH! And since they won't let me drink scotch after lunch at work (bastards!), I'll just have to settle for some old fashioned POTM action.

So, who gets the big nod, the giant clap, the... okay, moving right along, who wins this month's Razer BlackWidow keyboard? Who's posting REIGNS SUPREME?!?!

JUGGS! For his excellent tale of Thailand and fight-prep!
http://forums.atomicmpc.com.au/index.php?showtopic=42235

And, of course, we also have almost-as-epic runners up. It's all gold, baby!

Twinair's formating thread - awesome troubleshooting action.
http://forums.atomicmpc.com.au/index.php?showtopic=40565

Periander, for his thread on hiring developers.
http://forums.atomicmpc.com.au/index.php?showtopic=42219

And finally, big hugs to all our tech brethren who helped out in MattIngle's graphic design thread.
http://forums.atomicmpc.com.au/index.php?showtopic=42147

Bravo, gang. Bravo.

POTM
WINS A RAZER BLACKWIDOW!

MODIFICATION

With Ashton "Two mods are better than one" Mills, esteemed editor of CHOICE Computer and an avid fan of dwarf shaving.

Darthmod Shogun 2

Game Total War: Shogun II
URL www.twcenter.net/forums/showthread.php?t=437591

Nihonn go wo renshu suru hitsuyou ga arimasu!

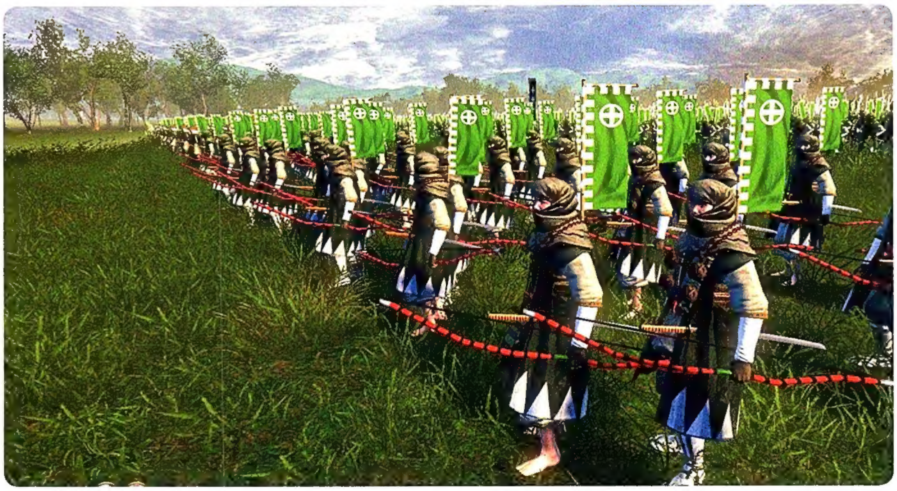
So English will suffice. Shogun II is its own kind of sublime bliss for the conquering General, but can it made better?

Hai! The Shogun 2 Darthmod aims to take all those niggly aspects of the original game and fix them right up, while adding a few new boons of its own. Specifically, it focuses on reducing what the author calls 'arcade' factors, and in turn add more realism. This includes changes such as reduced infantry movement speed, improved lethality of melee combat, reduced homing effect of archery, changes to morale and AI tactics, expanded diplomacy and economy to promote larger armies, removal of projectile trails and Horo balloons (and which also helps to increase FPS), better naval battles, and improved clan unit diversity. To name just a *few* things.

It also incorporates two other popular Shogun II mods: the Atmospheric Sounds mod, which adds a wider variety of melee, projectile and, er, pain sounds of dying soldiers to really revel in your victories (or losses); and Clans Retextured, which aims to better differentiate each clan with unique colours and textures, further improving your battlefield delight.

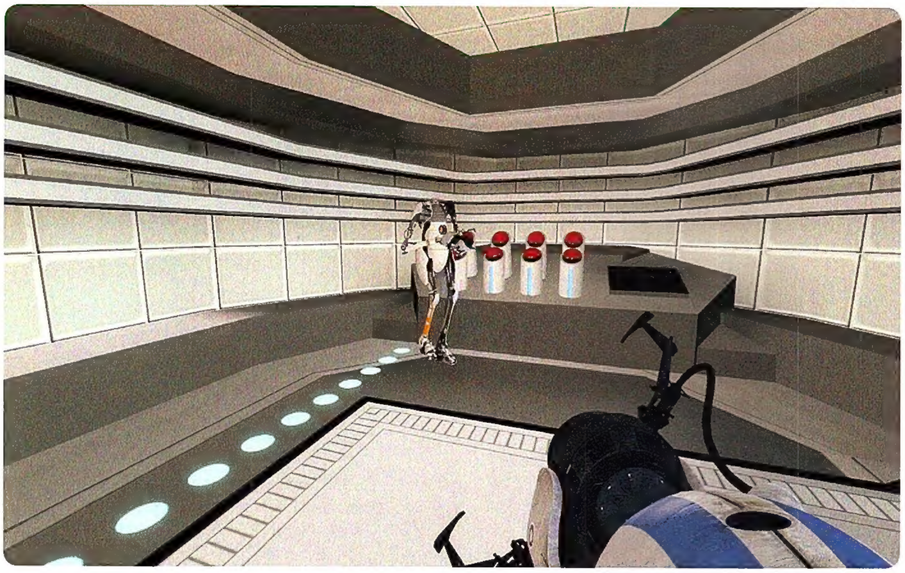
The end result is larger-scale, more epic, and more engaging combat which can only be a good thing, seeing as Shogun II is *all* about the combat. However, it also makes the game a tad harder, but maybe that's a good thing for the veterans. There's certainly no harm in giving it a go if your inner Shogun feels a need to unleash *total* war.

Mata atode aimashou!



Colours

Game Portal2
URL www.moddb.com/mods/colours



So, don't want to alarm you or anything, just keep calm and... you know.. uhh.. just, just look away a moment okay? Then I'll show you. No no, that's fine, turn around. When you're ready. It won't work if you look. Ready?

TA-DAAA! Look! It's a mod! For Portal 2! Already! I know, I KNOW! Go on then, go 'ave a play. You'll like it I promise.

Well maybe, if you bring a friend. Not me though. I can't hold a portal gun. And this mod needs two people! Or two of you, but you can't clone yourself, so find a friend. Somewhere in here. Maybe look in that pile over there.

Anyway, it's called Colours and its, well you know, got colours in it. And walls. And probably a sky beyond the walls but we can't see! Oh geez, isn't that nice. So nice. Sorry, got distracted a mo– and you need to get out, as usual. Use those portals. And your brain. Solve something. That sort of thing. Fun, I hear. Sure, for those of us *with arms*.

Go on, go on, don't wait for me. Download it, chuck it in, fire it up, spank the monkey! No wait, that's not right, is it? Did people used to say that? Anyway you have all you need to know. It's a co-op mod, for Portal 2, perhaps the first. So stop pointing that thing at me and making the peeoow! sound. I'm not a portal wall. I don't open up. Stop that. STOP IT! *sigh*.

Just be sure to follow the installation instructions. Read the file called INSTUCTIONS. TXT. Don't pretend you can't read, I've seen you do it. Or maybe you were just making faces. I'm not sure... better not be the faces. I don't like faces. You know why? Because I don't have one! There, I said it. I envy your face. Oh dear, oh dear, I'm talking too much again. Go, GO! There's there link, I'll see you in a bit.

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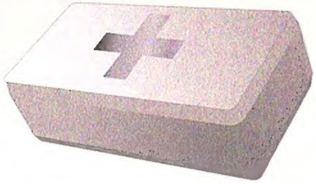
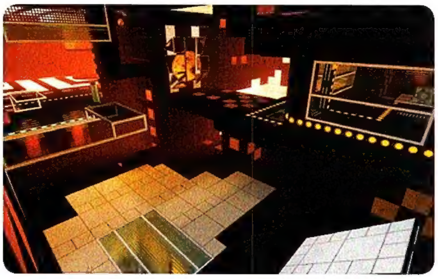
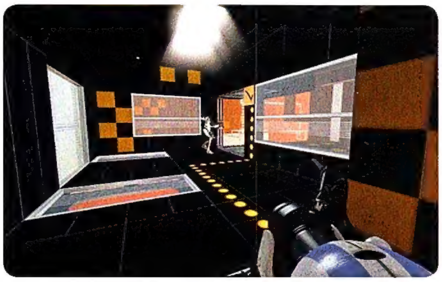
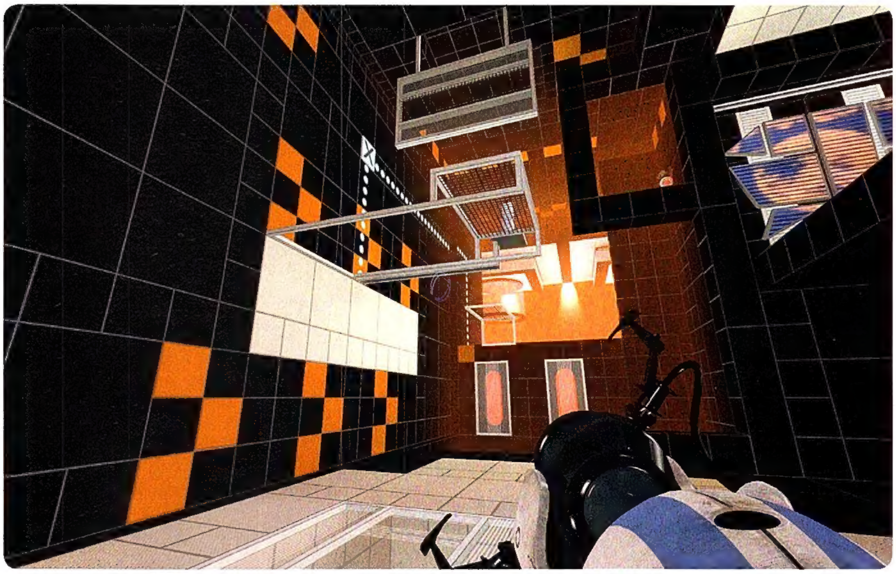
PATCH notes



- Blood Bowl Patch v1.2.0.1
- World of Tanks Patch v0.6.3.11 to v0.6.4
- Assassin's Creed: Brotherhood Patch v1.02
- Starcraft 2: Wings of Liberty Patch v1.3.3
- World of Warcraft Patch v4.1.0 to v4.1.0a
- Shift 2 Unleashed Patch v1.01
- Eve of Destruction Mod Patch v2.31 for Battlefield 1942







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The hands-free video camera isn't all that new – cyclists have been using them for years, and not just to document all those times that cabbies try to run them off the road – but they've mostly escaped our attention until now because, well, we're indoor people and we don't do much that requires hands-free video in locations where a tripod wouldn't work.

But we have to say that if we were the kind of people who went out into nature a lot, and wanted to document our trips, we would be mighty impressed by the Contour+. It captures full HD, has an integrated HDMI port, bluetooth and an internal transmitter, for live streaming. Or maybe we can just take it LARPing…

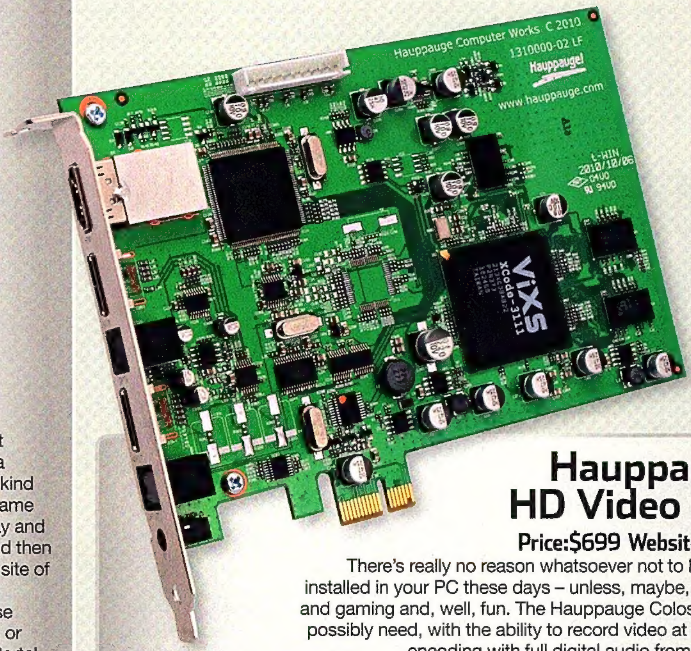
Kaiser Baas Series 8 Game Recorder

Price: :$79.95

Website: www.series8gaming.com

Let's face it: these days, everything we do can, at some point, end up on the internet. That can be a truly, truly frightening concept. But it can also be kind of fun, if you're the one in control. The Series 8 Game Recorder is a nifty little tool that allows you to play and record console games full-screen on your PC, and then upload the resulting footage to the video hosting site of your choice.

Whether you've just managed to get your horse to something amusing in Red Dead Redemption, or you've perfected the most elegant solution to a Portal 2 puzzle, now you can share your brilliance with the world. Or you can just use the included video editing software to fake some…



Hauppauge Colossus HD Video Capture Card

Price:$699 **Website:** www.newmagic.com.au

There's really no reason whatsoever not to have a HD video capture card installed in your PC these days – unless, maybe, you hate video and television and gaming and, well, fun. The Hauppauge Colossus has all the bits you could possibly need, with the ability to record video at up to 1080i using H.264video encoding with full digital audio from component or HDMI devices.

What that means is that you can pretty much record anything: TV, movies, gameplay (from consoles, too). You could become a media mogul! Or just a regular old pirate (NOT that we condone that kind of behaviour).

NetComm Home Entertainment Connection Kit

Price: TBC **Website:** www.netcomm.com.au

Time for some hardcore honesty: we get a lot of stuff through for Gearbox that we think is pretty cool, but have no real use for in our own lives. This is the opposite of that – it's not really very interesting, but we actually spent the weekend searching for something that would solve the very problem that the Netcomm Home Entertainment Connection addresses, and so we kind of love it.

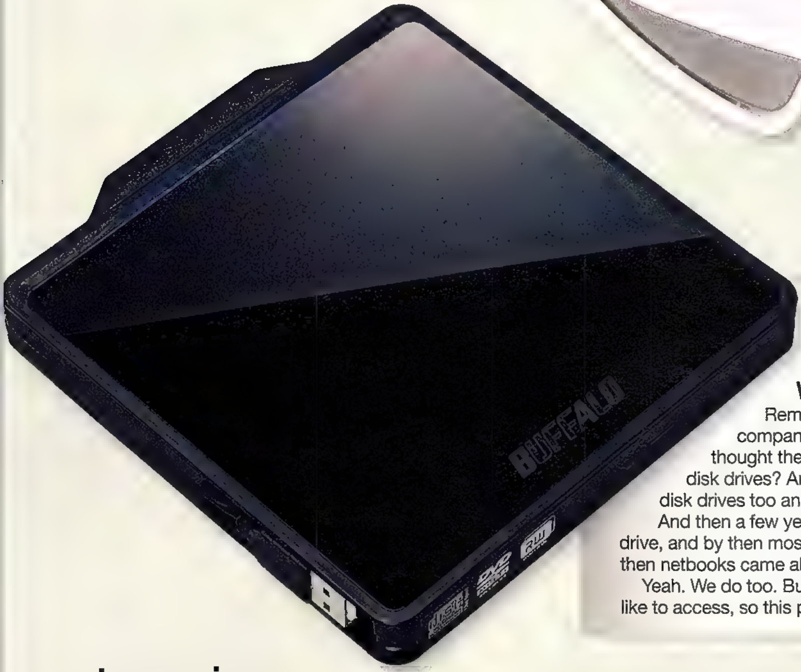
This kit lets you use your homes existing wiring as defacto Ethernet cabling, by way of two little boxes – one that plugs into your router, and one that plugs into whatever powerpoint you want to act as your second Ethernet outlet, where you can connect up to four devices. The result: not having to drill a hole in our ceiling in order to get the gaming beast online. Win!

Evercool Dr. Cool Router Cooler

Price: TBC **Website:** www.evercool.com

There's an old Simpsons joke about the path to a successful invention involving taking something that already exists and putting a clock in it. We here at Atomic tend not to think along those lines, but sometimes we do wonder about the things that come across our desks. And… a router cooler? Named Dr Cool?

On the other hand, our router does live behind the television, and it probably does get warmer than we give it credit for, and if someone gave us a router cooler, we probably *would* use it. Which we guess makes this a good idea – just one that seems a little silly at first glance.



Buffalo Portable DVD Drive

Price: TBC

Website: www.buffalo-technology.com

Remember the kerfuffle when a certain fruit-flavoured computer company shipped a computer without a floppy disk drive? And everyone thought the world would end, except the people that made external floppy disk drives? And then all the other computer manufacturers ditched their floppy disk drives too and now you never see them?

And then a few years later that same company released a laptop without an optical drive, and by then most people were like, 'Eh, optical drives are so last generation.' And then netbooks came along and now optical drives are weird?

Yeah. We do too. But we also have a whole stack of discs at home that we sometimes like to access, so this portable DVD drive is just fine and dandy by us.

Where's wireless at?

Jake Carroll unravels the mystery of the so-called wi-fi revolution.

Whether you're enjoying a new tablet or video chatting with your friends on a smart phone, the networks that your packets are traversing through have a significant impact upon the all-important user experience. Poor network performance can spell the death of a product, despite how good a device itself may be. Consumer love and hate flows easily, especially where network performance is concerned. No greater examples of this can be found than close to home with our mobile phone networks. We'll leave name-calling and defamation for the angry masses.

It comes as no surprise that while the NBN pushes on at a snail's pace, we've got our heads in the clouds with wireless communication. This month, we're going to try and find our way through the LTE and 4G maze.

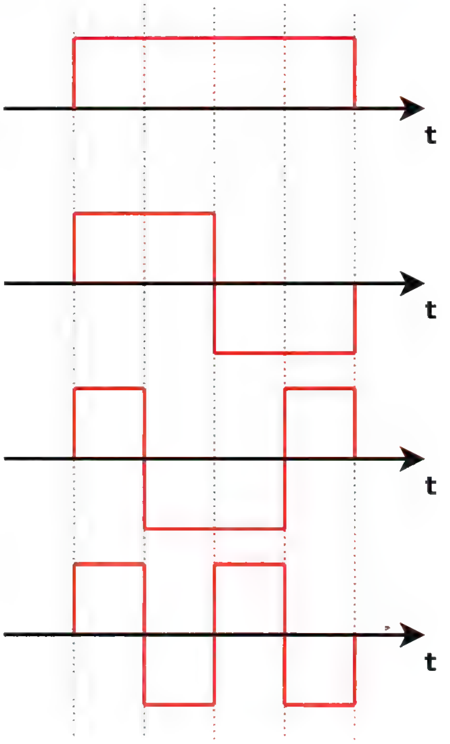
They aren't paying the marketing division enough

One of the problems with naming conventions for mobile phone and communications standards is how to define the name. Rarely do international bodies agree upon names. Consequently we end up with productised names that the marketing groups and product vendors give to much less attractive sounding acronyms. The real, correct and full name for LTE is Third Generation Partnership Project Long Term Evolution. We said it wasn't attractive, didn't we? The consumer name for LTE, and the name that is productised, is 4G, even though LTE itself doesn't comply with all the required standards put forth by the IMT (International Mobile Telecommunications) working group. This is only the beginning of the confusion.

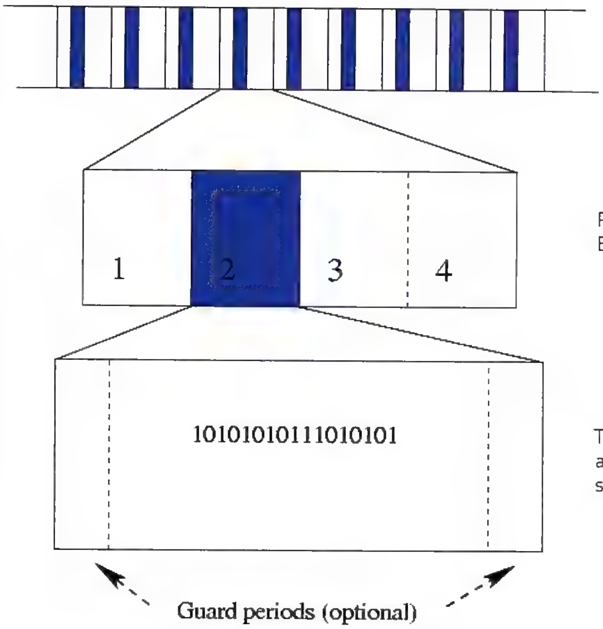
As with many standards for mobile communications and packet data-over-air before it, the intention of LTE is to increase throughput, available bandwidth and data rates to mobile devices. The specification allows for peak rates of 100Mbit/s downstream with an upstream bandwidth of 50Mbit/s. To put it into perspective here – very few people in Australia enjoy this kind of downstream bandwidth, much less upstream. The specification also calls for a latency tolerance of no more than 10ms. We can only hazard a guess that this is to allow for extremely low latency applications and real time communications, given the prevalence and growth of casual video conferencing. More on all of this later.

The lay of the land

The current structure of mobile communications is a bit different than the TCP/IP stack and 7 layer OSI model we know and respect. To understand how the mobile networks hang together, we need to explain the sandwich and layer-cake that it is made up of. It all



CDMA exploiting mutually orthogonal digital signals.



Data stream divided into frames.

Frames divided into time slots. Each user is allocated one slot.

Time slots contain data with a guard period if needed for syncronisation.

TDMA construction.

starts with GSM or the Global System for Mobile Communications. We're ignoring the '1G' network, because it was an analogue transmission medium, with little scope for packet data communications. We'd much rather ignore the whole GSM background, skipping 2G and 3G – but we need to explain these stepping stones to fully understand 4G.

NTT DoCoMo launched the first Internet service on a mobile device in Japan in 1999. i-Mode was the first set of services to give the world a taste of information in the palm of your hand. i-Mode used a group of half-borrowed and half-new protocols from the traditional TCP/IP stack, but implemented none of them entirely. This was considered a GSM 2G service.

2G services and technology are defined by the international standards bodies in several different ways, but generally are enclosed by TDMA and CDMA signal and frequency splitting techniques. GSM 2G (TDMA based) accounts for over 80 per cent of the entire market. The difference between CDMA and TDMA devices is the form of multiplexing the device uses. Note, that the term CDMA is a generic acronym describing a form of multiplexing technology, with the actual telephony platform being correctly known as CDMAOne or IS-95.

TDMA or Time Division Multiple Access isn't as complex as it sounds. It's a mechanism that allows many users to share the same frequency or channel coming from a cell tower based upon dividing a signal into different time slots.

CDMA or Code Division Multiple Access is more complex then TDMA. In contrast to TDMA, which shares spectrum using time slices and slots, CDMA uses spread spectrum sharing with special coding attached to each signal transmitted to and from a device to the tower. This can be achieved because CDMA's underlying bandwidth limitations are less restrictive than that of TDMA. Just to reinforce the point, though. CDMA is a form of multiplexing, not the branding or company name given to a handset or service (which would be CDMAOne or IS-95).

In trying to think of an analogy to explain the difference between the two technologies, we were reminded of a beardy old guy that lectured some of the past and present Atomic staff writers in university for Data Comms 101.

1. Let's suppose there is a room full of people in which they all wish to talk to each other simultaneously.
2. To avoid being completely confused, each person could take turns speaking.
3. That's TDMA in action.
4. It all happens so fast on a GSM network however, that conversations never have issues of latency.
5. To take it a step further however, all the people become impatient and insist on speaking at the same time.
6. As long as everyone has really good hearing and each pair of people are speaking unique languages, meaningful communications could be sustained.
7. This is how CDMA works.
8. Other languages bouncing around the room are perceived as noise, and ignored and rejected.

In practicality, CDMA is considered better than TDMA/GSM because of features such as (notionally) better security, theoretically better call quality, demonstratively more efficient use of the frequency/spectrum available and a lesser likelihood of dropped calls. The flipside to all of this is that it's a more complex negotiation and circuit setup, the technology requires more power utilisation and from all accounts, the fabrication techniques for CDMA modem/data comms devices inside mobile phones are slightly more expensive.

The third generation.

The third generation of mobile devices promised far higher data rates and more efficient bandwidth utilisation. It actually delivered, too. The most common standards used by the majority of carriers for 3G services are:

EDGE

-This is one of the more common low-cost forms of 3G implementation, because it's effectively an extension of GPRS, way back from the 2G GSM days. No rip and replace of major infrastructure required. The very newest EDGE (known as Evolved EDGE) could deliver 1Mbit/sec down and 400Kb/sec up.

-Some argue that EDGE is really a 2.9G service, as it's an extension of 2G GSM.

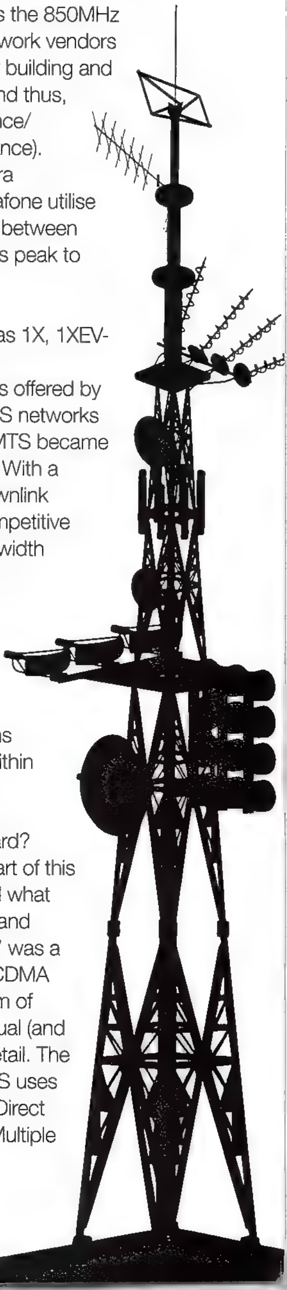
UMTS

- W-CDMA is the most common form of deployment.
- HSPA, HSDPA, HSUPA, HSPA+ (High speed packet access) is the 850MHz standard that many network vendors suggest provides better building and concrete penetration (and thus, better indoor performance/built up metro performance). Networks such as Telstra NextG, Optus and Vodafone utilise such services to deliver between ~14Mbit/s and ~21Mbit/s peak to existing services.

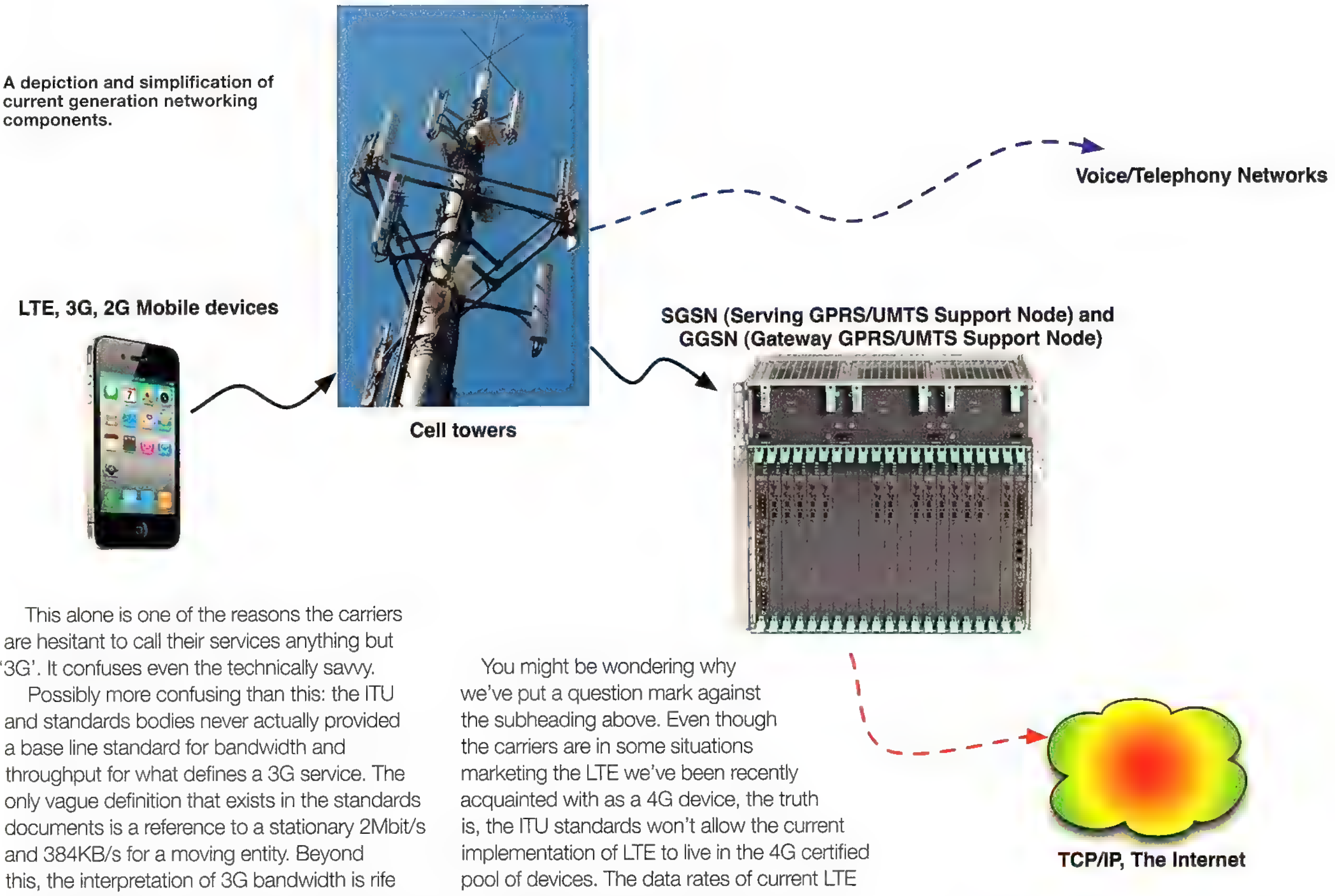
CDMA2000 (also known as 1X, 1XEV-DO and IMT Multi-Carrier)

- The EVDO standard was offered by Telstra amongst other US networks such as Verizon until UMTS became a more viable standard. With a peak single channel downlink of 14.7Mbit/s, it is a competitive and relatively high bandwidth transmission medium.

At this point, you'd be forgiven for being a bit confused. How could UMTS (Universal Mobile Telecommunications System) have W-CDMA within it, and in the same breath, CDMA2000 be an entirely different competing standard? Remember in the earlier part of this article where we described what CDMA and TDMA were – and that the name 'CDMAOne' was a technology in name only. CDMA itself is simply a mechanism of multiplexing signals. As usual (and again), the devil is in the detail. The CDMA methods that UMTS uses are known as DS-CDMA (Direct Sequence Code Division Multiple Access).



A depiction and simplification of current generation networking components.


LTE, 3G, 2G Mobile devices
Cell towers
Voice/Telephony Networks
SGSN (Serving GPRS/UMTS Support Node) and GGSN (Gateway GPRS/UMTS Support Node)
TCP/IP, The Internet

This alone is one of the reasons the carriers are hesitant to call their services anything but '3G'. It confuses even the technically savvy.

Possibly more confusing than this: the ITU and standards bodies never actually provided a base line standard for bandwidth and throughput for what defines a 3G service. The only vague definition that exists in the standards documents is a reference to a stationary 2Mbit/s and 384KB/s for a moving entity. Beyond this, the interpretation of 3G bandwidth is rife with artistic license. This is one of the reasons telecommunications carriers can in our country advertise a 3G service to consumer level users without a guaranteed QoS (Quality of Service) or a statement about minimum or maximum bandwidth attainable on their mobile device.

...the truth is, the ITU standards won't allow the current implementation of LTE to live in the 4G certified pool of devices.

The fourth generation?

4G isn't a term you'll hear much just yet. The IMT-Advanced standards bodies set the bandwidth requirements early in 2008 at 100Mbit/s for high mobility communications and 1Gbit/s for low mobility applications (pedestrians and stationary devices, such as SIM/mobile comms failover in DSL routers et al).

The pure all-IP stack is the most significant part of 4G communications. Up until now, we've had packet switched, unrouted, non-standards controlled means of protocol negotiation and circuit setup for every call me make. With the advent of 4G technologies, we leave that all behind for IP, with all the familiarity, flexibility and simplicity of physical and WiFi TCP/IP networks.

LTE fits into this slot. This is where we are just about to sit in market evolution.

You might be wondering why we've put a question mark against the subheading above. Even though the carriers are in some situations marketing the LTE we've been recently acquainted with as a 4G device, the truth is, the ITU standards won't allow the current implementation of LTE to live in the 4G certified pool of devices. The data rates of current LTE 4G marketed devices are incapable of 1Gbit/s downlink, and as a result are (strictly speaking) not 4G devices.

Current generation networks utilise several intermediary devices to gain access to TCP/IP-like services and functionality. In the case of current generation CDMA2000, EV-DO 1x, GPRS and UMTS networks, hand-over

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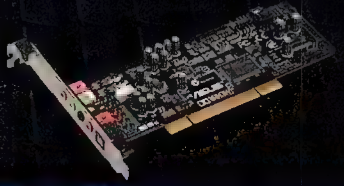

Xonar DG

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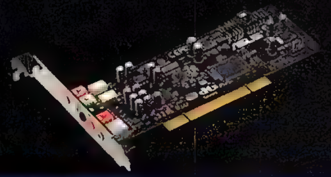
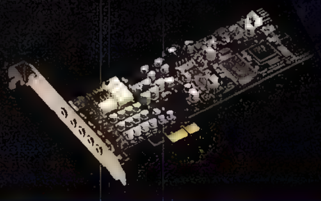
Headphone AMP,
5.1 surround sound delivered by Dolby headphone.
RRP: $40



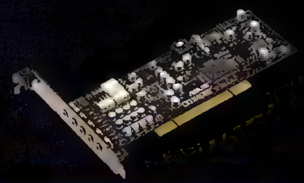
Xonar DS

107dB SNR rating,
7.1 channel DTS surround sound,
Jack-sensing front panel connect
RRP: $70



Xonar DX

116dB SNR rating,
Complete Dolby Feature set,
Support EAX 5.0 for gaming,
PCI-E
RRP: $115



Xonar D1

116dB SNR rating,
Complete Dolby Feature set,
Support EAX 5.0 for gaming,
PCI
RRP: $110

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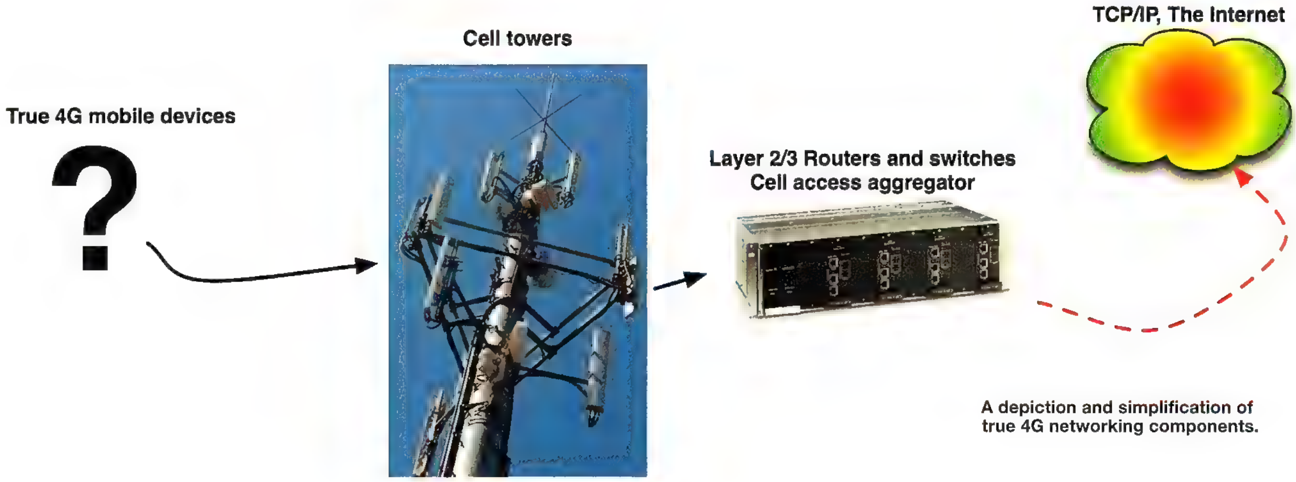


A depiction and simplification of true 4G networking components.

devices are responsible for delivering IP addresses and the data link layer back to the mobile handset or wireless device. On some devices, such as the iPhone4, one can enter a field-test mode by dialling *3001#12345#*. On Samsung's Galaxy based devices, the number is *#*#197328640#*#*. Within these modes, one can gain an appreciation for the convoluted setup procedure just to gain an IP address.

In a true 4G specification, the IP layer will flow from the Internet, associated gateways and routers, back to the mobile device, without the need for hand-off or external delivery devices. The evolution of these networks has formed a new term, known as an AIPN or All IP Network.

For time being, companies that have implemented LTE have settled on a maximum downlink rate of 384Mbit/s using 4x4 MIMO-style antennas. The maximum uplink rate has been set at around 87Mbit/s.

The real fourth generation

True 4G devices aren't actually available, despite what the vendors might have us believe when marketing new handsets. Because 4G devices aren't available yet – and nor are the underlying systems finalised – there are several candidates and implementations that may make it in to the final specification for vendors and chipsets.

LTE-Advanced

This is an enhancement to the LTE we have currently. It's not a new technology, but an overhaul and speed-increase upon the standard. The estimation for LTE-Advanced is a peak downlink line rate of 1Gbit/s, falling in line with the ITU and IMT guidelines for 4G systems. At this stage, the current release (v8) only supports 300Mbit/s.

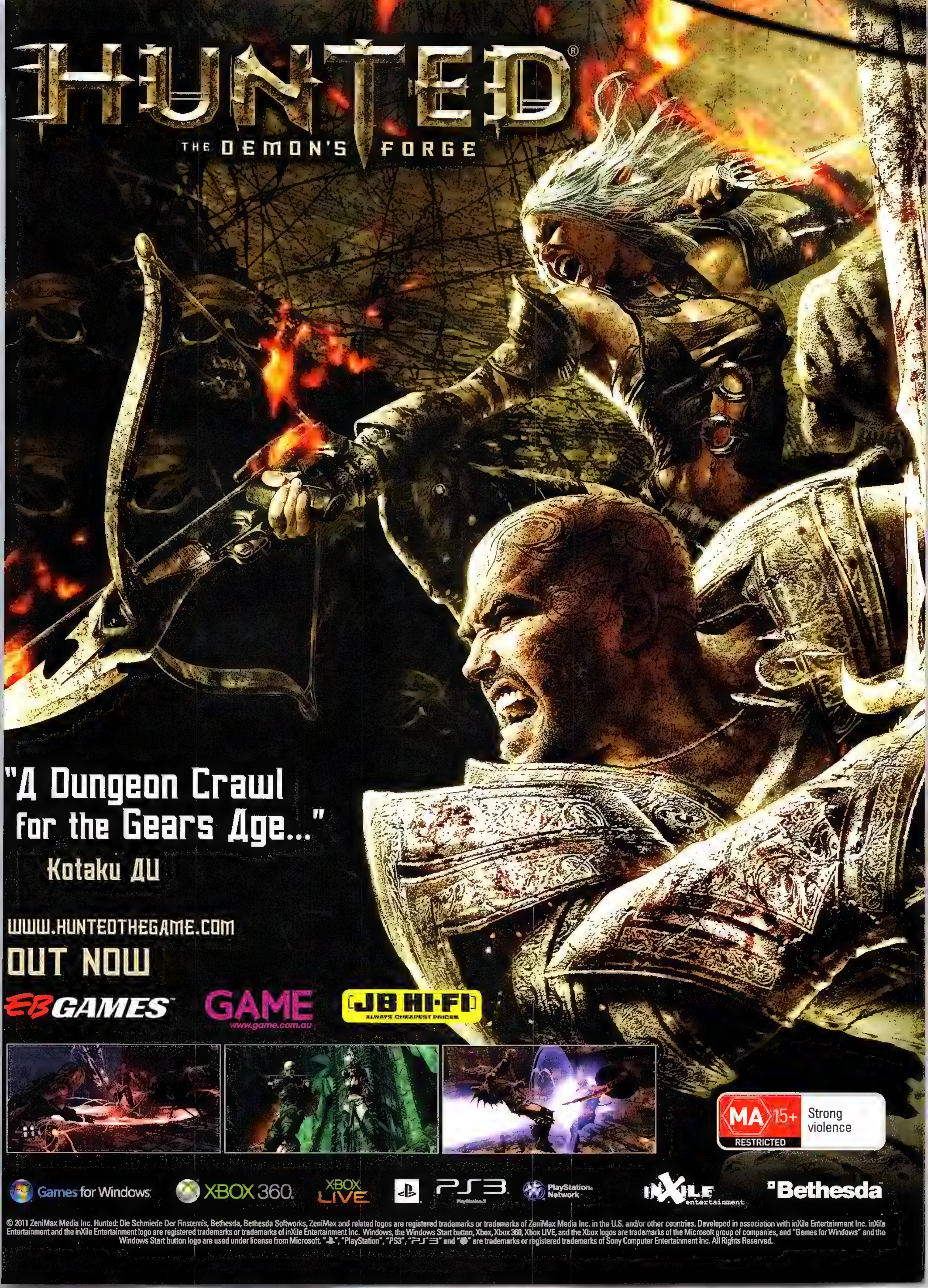
IEEE 802.16m

The commercialised and marketed name of the 802.16e standard is actually 'WiMAX'. It's known popularly in some European countries as WirelessMAN (Metro Area Network). Several countries are using WiMAX services already – with South Korea being the first to take up such services in early 2006, on their KT network. The plan is to further enhance the 802.11e standard to bring it up to 4G regulations, then revise the name of the IEEE standard to 802.11m. Confusing, huh?

There are some really lofty goals that the ITU and IMT standards bodies have set for 4G devices. The literature suggests a guaranteed quality of service, a qualification for being able to transfer at a minimum of 100Mbit/s between any two 4G devices in the world, a seamless handoff between any heterogeneous networks and as we've discussed, an AIPN. On top of that, guaranteed interoperability with all major vendors femtocell's (home nodes for mobile communications that facilitate better coverage of mobile devices, by using fixed bandwidth infrastructure, just as Optus and Vodafone have released, in recent weeks) is being sought. The challenge is to produce an acceptable product that delivers on these promises.

For time being, we're happy to walk around checking our email and ignoring that 'FaceTime' button.

The Samsung Craft. Apparently, the world's first 4G device, which isn't actually a 4G device at all – but an LTE device pretending to be 4G.



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INPUTOUTPUT

Dan Rutter brings the answers to
your questions like no-one else can.

I/O OF THE MONTH

String, piece, length of, further enquiries

I Last issue, you explained why there was no way to tell what brand of hard drive was best. So I'm not optimistic about getting a positive answer to this question, but here goes anyway: Are SSDs more reliable than hard drives?

There are plenty of SSD horror stories on the web, but I suppose part of the problem is that SSDs are developing fast, so how long last year's model of SSD survives means even less than how the last generation of hard drives fared.

Still, if it's possible to know how reliable SSDs are for 30 times the price per GB of a HDD, I'd like to know!

Cooper Martyn

O Short answer: Nobody knows. Long answer: Uh, how much time have you got?

Drive durability depends on a large number of variables. You can rule out only some of them by restricting your survey to 'normal' usage profiles, for home PCs that do Web browsing, boring office apps, and games.

Many of the people most in love with SSDs are not these 'normal' users. Instead, they need to work intensively on datasets much larger than even a serious PC's RAM. The main SSD performance advantage, near-zero latency, is a huge plus for this. Compiling large programs, scientific computing, serving databases to lots of users, that sort of thing.

In these cases, the user may not even much care if their SSDs only live an average of 12 months. Sure, it's annoying to lose a day's work and then maybe a whole extra day restoring backups and patching holes, but in those 12 months SSDs can get as much disk-intensive work done as 18, or more, months with mechanical hard drives.

Us regular schmoes with normal PCs may not be so entranced by a lightning-fast disk subsystem, if the downside is truly much lower drive lifespan.

The only SSD-life risk factor I'd be willing to bet even a modest amount of money on being real, though, is excessive writes, usually caused by putting your swap file on your SSD.

Even low-end SSDs now have enough capacity that their wear-levelling firmware should be able to spread constant swap-file writes over the physical memory cells and, according to specification-sheet write-tolerance numbers, give several years of service.

But SSDs that cark it in the first year are, as you've noticed, not unknown.

I think, again without a very large amount of confidence, that one reason for the surprising number of failure reports may be that the vast majority of current consumer SSDs, and all of the cheaper-per-gig models, use multi-level cell (MLC) flash RAM instead of single-level cell (SLC). SLC stores one bit per memory cell; MLC stores more than one (typically two), and is slower and less reliable.

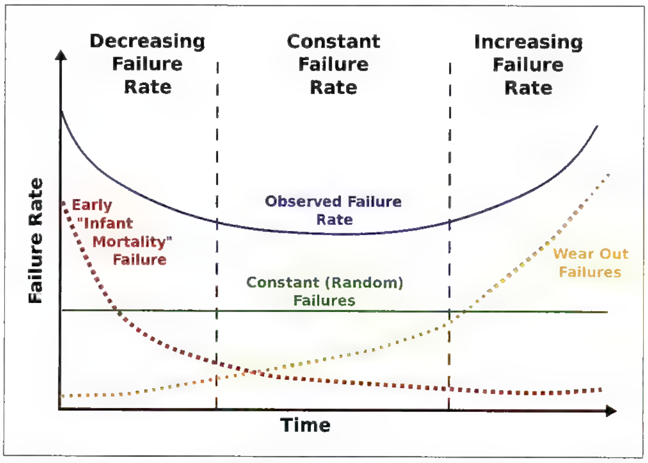
It's impossible to tell how representative the complaints are, though. If you spend $500 on an SSD with much less capacity than a $150 hard drive, and your expensive SSD drops dead young, you are probably more likely to complain online than someone who has a similar experience with a cheap hard drive.

For what it's worth, most of the drive companies have officially stated that SSDs are, if anything, *more* reliable than spinning disks, and they've backed up these statements with similar warranties to the ones you get on hard drives. Some of the Mean Time Between Failure figures for SSDs are even more ridiculous than those for spinning disks.

I've always said you should expect your hard drives to die at the age of two. They'll probably live longer than that, but given the endless plummet of storage prices and how easy, relatively speaking, it is to clone a *working* boot drive onto a new device, bi-yearly drive replacement is not a bad idea.

And you can extend this to SSDs, too. All you have to do is have enough hard-drive space to hold an image of your boot SSD, and then image the SSD to the spinning disk regularly. It's easy to do this with something like DriveImage XML, the basic version of which is free, and which can image a boot drive while Windows is still running.

Restoring the image is a bit, but not a lot, more annoying. And this sort of backup isn't terribly safe, if the backup drive is in the same computer as the SSD. But it's a heck of a lot better than nothing, and there's nothing stopping you writing the disk image onto a cheap spinning disk while you wait for a warranty-replacement SSD.



After enough people have lost their data, we may be able to figure out which of these curves SSDs are on.

I/O OTM

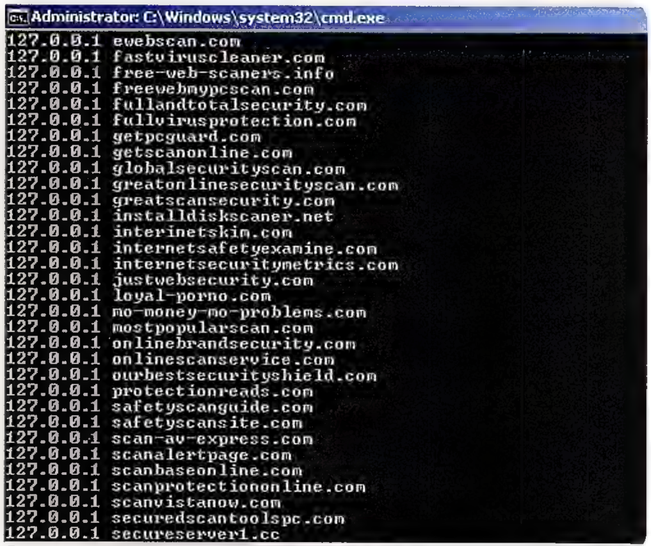
WINS A THERMALTAKE CHALLENGER PRO KEYBOARD

Hosts with the... mosts?

I I can't figure out what the hosts file is for. Apparently you can use it to block ads and viruses, and apparently you can also use it to completely break your ability to use unimportant things like, say, Google.

What's it do?

Tayla Copeley



```
Administrator: C:\Windows\system32\cmd.exe
127.0.0.1 ewebscan.com
127.0.0.1 fastviruscleaner.com
127.0.0.1 free-web-scaners.info
127.0.0.1 freewebmypcscan.com
127.0.0.1 fullandtotalsecurity.com
127.0.0.1 fullvirusprotection.com
127.0.0.1 getpcguard.com
127.0.0.1 getscanonline.com
127.0.0.1 globalsecurityscan.com
127.0.0.1 greatonlinesecurityscan.com
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127.0.0.1 internetsecuritymetrics.com
127.0.0.1 justwebsecurity.com
127.0.0.1 loyal-porno.com
127.0.0.1 mo-money-mo-problems.com
127.0.0.1 mostpopularscan.com
127.0.0.1 onlinebrandsecurity.com
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127.0.0.1 safetyscansite.com
127.0.0.1 scan-av-express.com
127.0.0.1 scanalertpage.com
127.0.0.1 scanbaseonline.com
127.0.0.1 scanprotectiononline.com
127.0.0.1 scanvistanow.com
127.0.0.1 securedscantoolspc.com
127.0.0.1 secureserver1.cc
```

I'm fairly sure you can do without most of these domains.

O The hosts file is a piece of low-level network configuration that's actually quite safe to play with.

In Windows, it's just called "hosts" with no suffix, and located by default in C:\Windows\System32\drivers\etc. It's a way of circumventing DNS.

DNS, the Domain Name System, is what your computer uses to turn www.example.com into the IP address for the example.com server, 192.0.32.10. Your computer sends the example.com request to the DNS server at your ISP, which can in turn ask more and more important DNS servers all the way to the Internet's 'root nameservers', if it doesn't have an answer already. One or another DNS nameserver finds the IP address for the domain name (if the domain actually exists), and hands it back to your browser or online game client or whatever. If you already know the IP address for some reason, you could use it directly, and not bother with the domain name at all.

There's more complexity here – like, for instance, DNS returns the IP address 180.150.130.230 if you ask it for www.atomicmpc.com.au, but typing that IP address into your browser will give you a Haymarket Media error page, because the server can't tell what domain, of the several run by Atomic's publishing company and hosted by the same server, you were looking for. But just resolving host names into IP addresses is the basic function of DNS, and this is exactly what a hosts file does – but it resolves host names into IP addresses *you supply*, not the addresses DNS would give you.

The operating system always looks at the hosts file before it talks to any real DNS server, so any host you block in the hosts file will never be resolvable.

The hosts file is plain text, and the lines in it that do something are the ones that start with an IP address and end with a domain name. (Lines that start with a # are comments, human-readable but ignored by the operating system.)

To use a hosts file to block a domain, you just assign some harmless IP address, traditionally the 'localhost' address 127.0.0.1, to every domain from which you don't want to hear. So if you want to block ads from, to choose just one of many entertaining entries in my own hosts file, fleshlightcash.com (that domain's parked now; I would appear to have missed my opportunity to make cash with fleshlights), you'd put a line in hosts that says:

```
127.0.0.1 fleshlightcash.com
```

Now any attempt to access that domain will instantly go nowhere and fail. (www.fleshlightcash.com will still resolve, though; you'll need to separately block that, and any other permutations of the address, if they exist.)

It's still possible for a 127.0.0.1'd domain to resolve if it's still in your local DNS cache. You can make sure any changes to the hosts file are working by typing 'ipconfig /flushdns' in a command-line window.

And yes, you can mess stuff up if you accidentally send microsoft.com or google.com requests to the bit bucket. But it's easy to change it back, by just removing that line from the hosts file.

If you're now wondering whether you can also use the hosts file to redirect all google.com requests to, oh, something like fleshlightcash.com: Yes, you can do that too.

Though people don't often do it on their *own* computers.

Could be worse. Could have that little animated dog.

I I recently switched to Win7. I like it well enough except for one thing. I LOATHE the alleged search.

In XP, I could open the search window and type the part of the filename I could remember, along with the drive I think it's on. C:\*.foo and away it goes. In 7, as far as I can tell, if you don't already know where the file is, don't bother even trying to search for it.

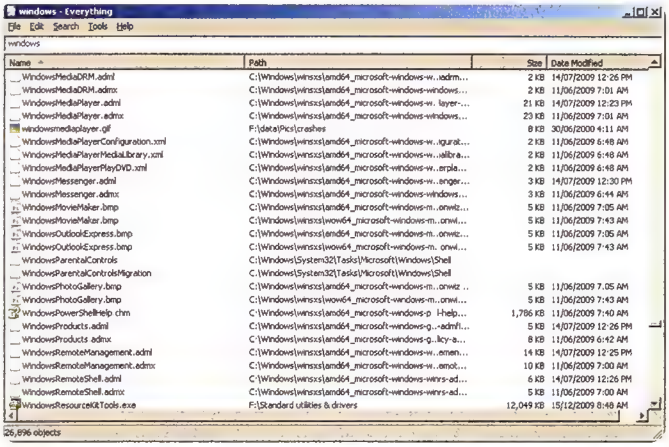
Is there any way to un-horrible the Win7 search? I've tried a couple of things that claimed to fix it, Agent Ransack and... another one whose name I can't remember and can't now find on the list. Both of them appeared to be just different skins for the same lousy search.

S. T.

O I haven't got a proper answer for you here, because there are several reasons why crap like this can happen. The standard indexed search may not be as useful as you'd think it'd be, but it at least shouldn't slow the computer down noticeably. If the search indexer scans tons of files on a hard drive while something else is also flogging the drive then there'll be a nasty performance hit, but Windows is actually pretty good at spotting when the indexer shouldn't be running. (This problem is also greatly reduced if you have a solid-state drive, which should have a seek speed close to zero.)

Pending a real answer, though, get 'Everything': **www.voidtools.com**

Everything is an *instant* filename search for NTFS drives. No content search, just filenames. It's surprising how often that's good enough – both for finding files, and for running programs!



windows

Name	Path	Size	Date Modified
WindowsMediaDRM.adml	C:\Windows\winsxs\amd64_microsoft-windows-w..iadrm...	2 KB	14/07/2009 12:26 PM
WindowsMediaDRM.admx	C:\Windows\winsxs\amd64_microsoft-windows-windows...	2 KB	11/06/2009 7:01 AM
WindowsMediaPlayer.adml	C:\Windows\winsxs\amd64_microsoft-windows-w..layer-...	21 KB	14/07/2009 12:23 PM
WindowsMediaPlayer.admx	C:\Windows\winsxs\amd64_microsoft-windows-windows...	23 KB	11/06/2009 7:01 AM
windowsmediaplayer.gif	F:\data\Pics\crashes	8 KB	30/06/2000 4:11 AM
WindowsMediaPlayerConfiguration.xml	C:\Windows\winsxs\amd64_microsoft-windows-w..igurat...	2 KB	11/06/2009 6:48 AM
WindowsMediaPlayerMediaLibrary.xml	C:\Windows\winsxs\amd64_microsoft-windows-w..alibra...	2 KB	11/06/2009 6:48 AM
WindowsMediaPlayerPlayDVD.xml	C:\Windows\winsxs\amd64_microsoft-windows-w..erpla...	2 KB	11/06/2009 6:48 AM
WindowsMessenger.adml	C:\Windows\winsxs\amd64_microsoft-windows-w..enger...	3 KB	14/07/2009 12:30 PM
WindowsMessenger.admx	C:\Windows\winsxs\amd64_microsoft-windows-windows...	3 KB	11/06/2009 6:44 AM
WindowsMovieMaker.bmp	C:\Windows\winsxs\amd64_microsoft-windows-m..onwiz...	5 KB	11/06/2009 7:05 AM
WindowsMovieMaker.bmp	C:\Windows\winsxs\wow64_microsoft-windows-m..onwi...	5 KB	11/06/2009 7:43 AM
WindowsOutlookExpress.bmp	C:\Windows\winsxs\amd64_microsoft-windows-m..onwiz...	5 KB	11/06/2009 7:05 AM
WindowsOutlookExpress.bmp	C:\Windows\winsxs\wow64_microsoft-windows-m..onwi...	5 KB	11/06/2009 7:43 AM
WindowsParentalControls	C:\Windows\System32\Tasks\Microsoft\Windows\Shell		
WindowsParentalControlsMigration	C:\Windows\System32\Tasks\Microsoft\Windows\Shell		
WindowsPhotoGallery.bmp	C:\Windows\winsxs\amd64_microsoft-windows-m..onwiz...	5 KB	11/06/2009 7:05 AM
WindowsPhotoGallery.bmp	C:\Windows\winsxs\wow64_microsoft-windows-m..onwi...	5 KB	11/06/2009 7:43 AM
WindowsPowerShellHelp.chm	C:\Windows\winsxs\amd64_microsoft-windows-p..l-help...	1,786 KB	11/06/2009 7:40 AM
WindowsProducts.adml	C:\Windows\winsxs\amd64_microsoft-windows-g..-admfi...	5 KB	14/07/2009 12:26 PM
WindowsProducts.admx	C:\Windows\winsxs\amd64_microsoft-windows-g..licy-a...	8 KB	11/06/2009 6:42 AM
WindowsRemoteManagement.adml	C:\Windows\winsxs\amd64_microsoft-windows-w..emen...	14 KB	14/07/2009 12:25 PM
WindowsRemoteManagement.admx	C:\Windows\winsxs\amd64_microsoft-windows-w..emot...	10 KB	11/06/2009 7:00 AM
WindowsRemoteShell.adml	C:\Windows\winsxs\amd64_microsoft-windows-winrs-ad...	6 KB	14/07/2009 12:26 PM
WindowsRemoteShell.admx	C:\Windows\winsxs\amd64_microsoft-windows-winrs-ad...	5 KB	11/06/2009 7:00 AM
WindowsResourceKitTools.exe	F:\Standard utilities & drivers	12,049 KB	15/12/2009 8:48 AM

26,896 objects

You know how much time this search took? *None*.

The pain

Ashton Mills goes through the pain and loss of hardware failure.

Gah.

Perhaps I've been lucky, perhaps like me you've often heard of hardware failures but never experienced one. I mean there *are* those return stats the purveyors of drives and video cards and motherboards certainly have. And maybe you've had a friend or relative or read of someone online having a failure. But in 20 years of building PCs, I've never been one of them – not a single part, in a single machine, ever.

Until now.

Cue dark and stormy night. Thunderous thunder and blinding lightning streaking across the rain-rippled sky, a lone wolf howls as if caught in a snare, a giant bat streaks across the inky darkness, and a mysterious and insidious laughter echoes in the foothills sending chills down your spine...

> It remained silent, mocking me with its distinct lack of activity. Spin, little fan, I cried. Alas it was dead. Deceased. Bereft of life.

Oh I wish. Actually I was just playing Portal 2, and then my computer switched off.

Just like that. Once on, now off.

Now cue Ashton, hands poised on WASD and mouse staring blankly at a blank screen for a moment. Eyebrow raises in curiosity, gaze turns to PC – not long born and borne on this Earth – and its distinct lack of fan whizzingness and brighty lighty.

Jaw drop, panic, fear. NOOOOOOO! [/Khan].

After a heavy sigh I tentatively trip the power switch. No go. Then again, at the wall this time. Still no go. But the monitor, speaker, router and friends are all working. It's just my baby. My carefully crafted joy-giver, less than six months old (see Technica Obscura, Issue 121).

It was time for deduction. The way it wouldn't even turn on meant it could be a short. What if it was the motherboard? This would mean a return and weeks without a PC waiting on a replacement. Unacceptable. Inconceivable! [/Vizinni].

One way or another, I had to find out. So began the task of deconstruction by removing first video cards, then sound card, and then memory turning it on at each step, hoping for error codes. Still silent.

It was now a PSU, CPU or motherboard problem. Gah, could I have fried my CPU? Did the H50 fail and it cooked in its overclocked juices? Not likely, given its thermal protection circuits.

Next step: unplug the PSU from the mobo and jump start it (with the help of a paper clip) via pins 16 and 17 to see if it turns on – and it didn't. Problem found.

I sat back, disappointed. Was it a surge? I doubt it. Aside from the fact it's plugged into a surge protector (though they can fail), monitor and other plugged-in devices were fine. As a precaution I removed it completely and tested it on two other power sockets in the house. Stranger things have happened, after all. It remained silent, mocking me with its distinct lack of activity. Spin, little fan, I cried. Alas it was dead. Deceased. Bereft of life. An ex-PSU [/Python].

As a rather expensive 1200W unit, which I shall not name (but you can look it up in aforementioned Technica Obscura) mere months old, I was not impressed. At least replacing the PSU is easier than the motherboard and, as it happens, I had a spare 1000W Zalman from my old system. I wouldn't trust it with three video cards, which I had planned to do down the track if I go Nvidia Surround, but for two-card SLI it's just fine. Perfect even, as the model I have uses heat-pipes near the vent, and sticking it into my Raven RV02 means convection will naturally dissipate heat as it rises through the cooling fins. Not a bad match really.

I guess it was just my turn, time to join the ranks of those who can lament a failed component. Perhaps coincidentally, or prophetically, my iPhone decided to spontaneously reboot itself this week as well, after which it now drains power at twice the rate. Marvellous. Maybe a digital apocalypse is coming?

Oh, and [/can you name the movies?]

Of course we can,
Ashton 'Computer CHOICE' Mills!!
amills@atomicmpc.com.au

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The Future of OpenCL

Ben Hardwidge investigates why we haven't seen more software that can take advantage of the processing power of graphics cards and reveals what the future may hold.

Much like Terrahawks, MiniDisc Walkmans and Flavour 'n' Shake crisps, traditional CPUs are starting to look decidedly dated. In fact, AMD has even coined a new three-letter acronym to prove that its new Fusion chips (see p36) are more than just plain old CPUs. As you may have noticed, AMD is calling its new silicon packages Accelerated Processing Units, or APUs. This is because they feature an integrated GPU graphics core, and can potentially do a lot more than a basic CPU with multiple x86 cores.

There's just one problem with this: AMD needs a general-purpose GPU (GPGPU) open-standard API to take off in order for its APUs to perform better than a mere CPU with integrated graphics. Of course, there are a few GPGPU-accelerated apps around now, but the vast majority of these are based on Nvidia's CUDA API, which requires an Nvidia GPU. Ideally, AMD needs software that's based on OpenCL, which in theory can work on any manufacturer's GPU. Will there ever be a time when OpenCL is more popular than CUDA among GPGPU software developers?

'My goal is to make that happen within 18 months,' AMD's Fusion VP Manju Hegde confidently tells us. 'That's the plan I've developed within AMD.' Hegde has been an important player in the progress of GPGPU, co-founding Ageia (the creator of PhysX), and then becoming a VP of Nvidia's CUDA team when the company took over Ageia. He's now attempting to push GPGPU software developers towards OpenCL and Microsoft's DirectCompute, and it looks as if many other companies are jumping on the OpenCL bandwagon as a result.

By the end of last year, Intel, ARM and IBM had all announced their support for the GPGPU API; other official adopters include Nvidia, Apple, Imagination Technologies and Activision Blizzard. However, Apple first submitted its proposal for OpenCL to the Khronos Group (which oversees the release of other open standards, including OpenGL) back in June 2008, and only a tiny amount of software uses it today. So why aren't we in the middle of an open-standard GPGPU software revolution today?

What's taken so long?

Part of OpenCL's problem is the time it's taken to get off the ground. The first official version (1.0) was released back in 2008, but Nvidia and AMD didn't release supporting SDKs until April and August 2009 respectively. Conversely, Nvidia first unleashed its CUDA architecture when it brought out the G80-based GeForce 8800-series GPUs – all the way back at the end of 2006.

Stéphane Bihan, chief of engineering options at French GPGPU enterprise software developer CAPS, says the lack of take-up for OpenCL 'is really because CUDA has been around for over four years, while the first version of OpenCL was only released a little more than a year ago now'.

He also adds that 'Nvidia put out a lot of evangelisation about CUDA', while we've so far seen very little in the way of a big marketing push for OpenCL from anyone.

'We haven't made a big push for OpenCL so far,' confirms Hegde, 'because we don't want to over-promise and under-deliver.' However, Hegde says that this is all about to change this year, when AMD starts marketing OpenCL to developers.

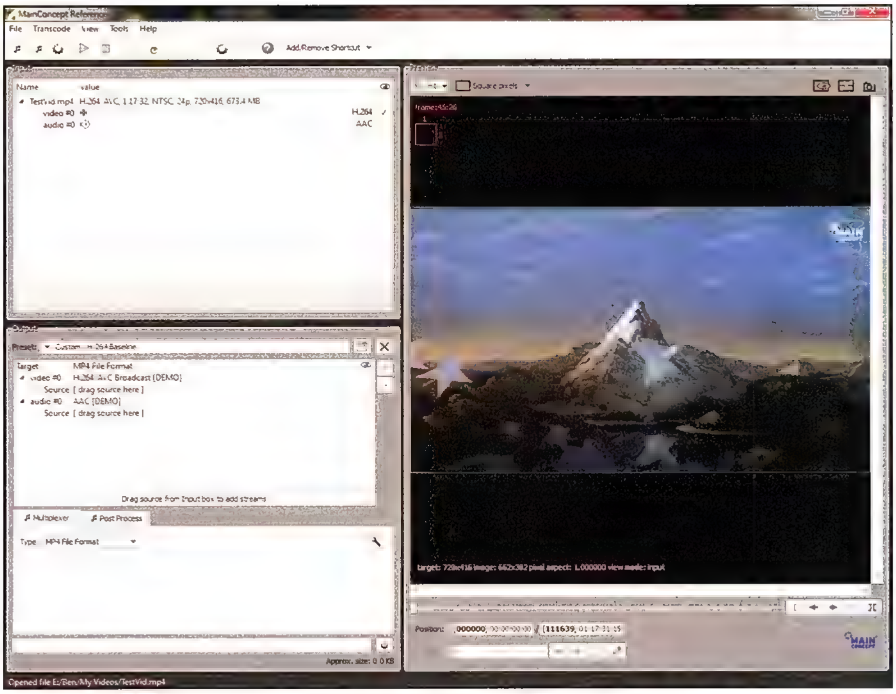
The company is holding the AMD Fusion Developer Summit between 13-16 June this year in Seattle, and Hegde says that by that time AMD's OpenCL push should be in full swing. 'In the preview to that, we'll step up developer tools marketing, as well as the API marketing,' says Hegde, 'so at that point, you'll be hearing about a number of applications and a number of announcements from our partners about them using OpenCL.'

AMD has already put up links to a handful of OpenCL demos on its website to coincide with the Fusion launch, but Hegde reckons that the OpenCL apps will properly start flooding in later in the year.

'We're also working with around 15-20 other ISVs (independent software vendors) on OpenCL applications over the next few months,' says Hegde, 'so I think we'll actually have at least 40-50 new OpenCL applications by the end of the year, and it will probably be more than that.'

He also notes that ArcSoft and MainConcept are already using OpenCL.

Whether this OpenCL software revolution will happen is yet to be seen, but AMD is clearly confident that a big shift towards OpenCL is about to occur. The question remains though: why has this taken so long – is it really so hard to program for OpenCL?



OpenCL acceleration is currently available in beta form in MainConcept's video decoding and transcoding software.

It's like assembly language for many-core systems

'If you'd asked me this question about OpenCL 1.0 and our 2.1 SDK, I would have said yes,' admits Hegde, 'but we've now released 2.3, and we're very close to finishing 2.4 and releasing it. At this point, I think OpenCL is pretty much equivalent to CUDA.'

Version 1.1 of OpenCL was released in June 2010 and, along with the new SDKs, it was hoped that this would finally push the GPGPU API into the mainstream.

However, at this point, it's also worth noting that OpenCL is a very different beast from CUDA when it comes to programming, and herein lie a number of complications, particularly in terms of the differences between GPU architectures.

'I would compare OpenCL to something like assembly language, but for many-core systems,' says Bihan. Basically, OpenCL is a low-level device API, while familiar programming languages such as C, C++ and Fortran can all be used on CUDA. Of course, there are ways of porting code from CUDA to OpenCL, but this is also fraught with problems.

According to Bihan, programming for OpenCL is also more complicated than programming for CUDA. 'When you have a function in C, for instance, you have parameters. If you want to write this function in OpenCL, you'd have to specifically pass the parameters of the function from the CPU to the GPU, while in CUDA, this is automatically carried out.'

However, it's worth noting that this is only really a problem if you're specifically programming OpenCL code. For example, Bihan says that OpenCL's low-level nature isn't necessarily a barrier to take-up. 'If you want to write OpenCL code, it takes some time to do,' he says, 'but it's a really nice programming model and language for compilers.'

Nvidia's EMEA solutions architect Dr Timothy Lanfear also notes that in terms of high-performance computing, there are still a few GPGPU features that can only be achieved with CUDA.

'The choice of which programming language or device API to use is typically based on the programming languages and style with which developers are familiar,' says Lanfear. 'Scientific and enterprise software developers often prefer to use C, C++, Fortran, Java or Python, and find that working with the high-level language based solutions supported by CUDA C/C++/Fortran are more familiar (and more productive) than the device API-based solutions such as DirectCompute or OpenCL. In addition, HPC applications often rely on library support for features such as FFT, BLAS, LAPACK, Sparse Matrix, image processing and more that are currently only available for CUDA C, C++ and Fortran.'

In theory, one of the main advantages of OpenCL is that it's supported by everybody's graphics hardware, including that of AMD, Nvidia, S3, Imagination Technologies and even Intel's new Sandy Bridge graphics core. However, this is only really of benefit if everyone takes it seriously, and this could prove to be a problem for AMD. After all, Nvidia has put a lot of money and resources into developing CUDA, and has been rewarded with the fact that most GPGPU software developers are using it.

There's a conflict here; while Nvidia does support OpenCL, and the company's vice president of mobile content, Neil Trevett, is president of the Khronos Group (which is responsible for OpenCL), Nvidia's main priority is clearly pushing CUDA.

'As a processor company, Nvidia supports all GPU programming languages,' confirms Lanfear, 'but Nvidia's platform for innovation is CUDA C and C++. We add new features to our CUDA Toolkit based on new GPU architectural capabilities and customer requests, and deliver two releases per year. We then work with the Khronos OpenCL group to incorporate new features, and when they're accepted as part of the OpenCL standard, we schedule them into Nvidia's driver release roadmap.'

Lanfear also describes OpenCL's perceived lack of vendor lock-in as a 'fallacy'. He points out that 'many of the OpenCL features we already support aren't supported by rivals' developer drivers, so running an OpenCL application that requires any of the widely needed extensions, such as double-precision, is only an option for end users with Nvidia GPUs. Until other vendors catch up with Nvidia's level of execution and delivery, OpenCL developers' only practical option is to focus on Nvidia GPUs'.

Nvidia is still supporting developers who want to use OpenCL but the way the company is doing this only really benefits Nvidia.

Nvidia is still supporting developers who want to use OpenCL but, not surprisingly, the way the company is doing this only really benefits Nvidia. 'To aid developers who are interested in eventually targeting OpenCL,' says Lanfear, 'Nvidia has published a CUDA C to OpenCL porting guide on our public website, showing how easy it is to convert CUDA C to OpenCL.

The problems with porting CUDA code to OpenCL

Great, you might think. After all, doesn't that mean any software developer can just port over its CUDA code to OpenCL and make it run on everyone's GPU hardware? Well, yes, but not in the way you might expect.

This is because different GPU architectures

When will we get a decent AMD GPU Folding Client?

Those of you who have been folding may remember how GPGPU folding started. When Windows XP was king and CUDA was just a glint in Jen-Hsun Huang's eye, ATI teamed up with Stanford to show how the Brook programming language could be used to harness the power of GPUs for computational tasks.

This was before GPUs had a unified shader architecture. Instead, pixel and vertex shaders had to be used, and graphics functions had to be coaxed into acting like general-purpose functions. ATI set the ball rolling for GPGPU folding, and then Nvidia's GPGPU client came out and knocked ATI's into a second place that wasn't even close.

The Folding@home GPU client runs on both GPU manufacturers' hardware, but it's mainly optimised for Nvidia's. Will we ever see another decent AMD GPU folding client?

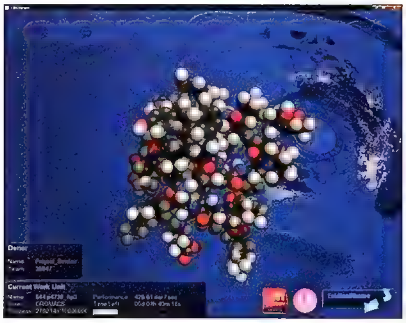
'I haven't really looked at Folding@home,' admits AMD's Fusion VP Manju Hegde, 'because the Fusion APU opportunity is just so much bigger, so my efforts have been focused on getting mainstream applications on OpenCL.' In fact, according to Hegde, the push towards getting more mainstream software on OpenCL has taken resources away from the optimisation of projects such as Folding@home.

'We actually had one of our top guys – probably one of the best engineers in AMD – looking at the Folding@home GPGPU relations,' says Hegde, 'but then we put him on a commercially more important task.' However, Hegde assures us that the GPU folding client will probably become a focus for AMD again in the future.

That said, it clearly isn't a priority for AMD at the moment, and the company's attitude towards Folding@home appears to be that it's more important to the tech press than mainstream consumers. Hegde describes it as a 'premium marketing application,' rather than a widely used app.

'I think Folding@home is something that particularly the specialist press and the analysts watch quite a bit,' says Hegde, 'but it has a disproportionate visibility. I know a lot of developers and people like you watch it, so it's really important for us to do that, but right now the Fusion launch, and everything else that we just launched a few weeks ago – all our resources are devoted to getting applications up and running on that.'

On the plus side, Hegde is confident that it can be done. 'There's no reason why the Folding@home client couldn't work well with our GPUs,' he says, putting the lack of an optimised client down to the lack of user-friendly tools, which AMD hopes to address soon.


Folding@home isn't a priority for AMD at the moment, so Radeon owners will be stuck with the old GPGPU folding client for a while yet.

'We've now developed a lot of tools, and at the time of the AMD Developer Summit (June 2011), we'll unveil a whole host of advanced organisation tools, which I know are going to make it easier to optimise OpenCL on our platforms and CUDA,' says Hegde. 'So after that point is when we'll probably take another look at Folding@home.'

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work in different ways. In fact, despite the fact that AMD and Nvidia's GPUs support the same DirectX standards, their differences are much more pronounced than the differences between standard x86 CPUs.

'If you write OpenCL code for one type of specialised hardware,' explains Bihan, 'it won't have the same performance as another type of hardware – you need to exploit different hardware features.' You could liken the situation to the way in which some games perform better on other manufacturers' hardware, despite using the same 3D graphics APIs.

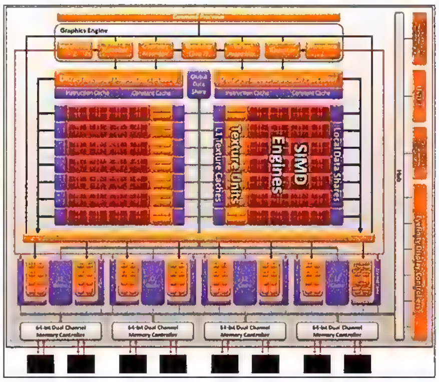
It's for this reason that Hegde says AMD actively discourages translating CUDA code directly to OpenCL. The resulting code will work on AMD GPUs, but it won't be optimised for AMD's graphics architecture, and will perform comparatively badly. One primary reason for this is the way in which the two graphics companies' stream processors work. A side-by-side comparison of the two companies' GPU architectures is beyond the scope of this feature, but we'll try to give you an idea

Optimising for different GPU architectures

Basically, Nvidia has a scalar GPU architecture, which means each stream processor handles one simple instruction at a time per clock. AMD groups its stream processors into clusters of five (including one super-stream processor) that can handle more complicated vector instructions. For example, if you're using a vertex shader, you'll want to calculate several points at once, so you could pass the whole calculation to a single stream processor cluster on an AMD GPU, or a combination of a few scalar processors on an Nvidia GPU.

Of course, it's more complicated than this, and in effect you can package instructions in various different ways on AMD GPUs. For example, you can send five scalar instructions to each stream processor in the cluster at once, making them behave like Nvidia-style scalar processors, or you can package various combinations of scalar and vector instructions, such as a three-point vector instruction and two scalar instructions. However, the software needs to be told to do this before it happens.

This isn't an issue for gaming, as most game developers will have optimised their games to use AMD's stream processor clusters efficiently. However, if you port CUDA code (which will almost certainly be optimised for individual scalar processors) directly to OpenCL, and perform no optimisations, you could end up with code that runs extremely inefficiently on AMD GPUs, for no other reason than it isn't optimised for groups of stream processors, rather than scalar units.



AMD's Radeon HD chips group stream processors together into groups, meaning that code ported from CUDA to OpenCL needs to be vectorised before it can run optimally.

It will work, of course, but you'll end up with a situation whereby the code uses only a fraction of the resources available to it, perhaps seeing each stream processor cluster as a single stream processor rather than a group of potential scalar units. You can already see this in applications such as the Folding@home client, which runs well on Nvidia GPUs, but extremely poorly on AMD GPUs.

'Nvidia has a scalar architecture, so if you take CUDA code using the same approach and use it for us, it doesn't work as well,' explains Hegde. 'In our case, you have to use all five instructions at a time, so you have to vectorise the code. One of the tools we've developed for compiling does a lot of vectorising, and that really improves the performance right there.'

Hegde also points out that other architectural differences can affect a GPU's performance when using OpenCL, including the number of registers. Meanwhile, according to Hegde, another issue is that the machine-produced code that comes out of a source-to-source translator often isn't user-friendly for developers.

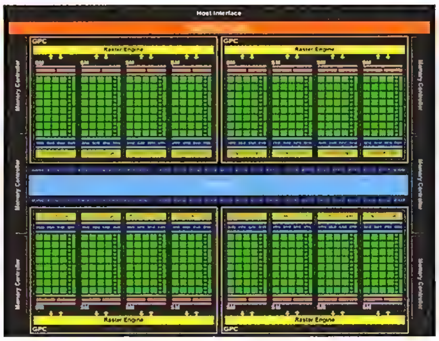
Future software

Interestingly, Hegde makes significant claims about the capabilities of AMD's GPUs once OpenCL code has been properly optimised. In particular, he thinks that AMD's GPUs could seriously compete with Nvidia's GPUs in the high-performance computing (HPC) arena, using OpenCL.

'We haven't concentrated strictly on HPC,' says Hegde, 'but we're trying to finish soon, and at that point you'll see that we'll have the performance edge.' This performance edge, according to Hegde, is a ratio of 2:1 when you compare peak FLOPS between the highest-performing Radeon HD 6000-series and Nvidia Fermi-series parts.

This is all very well, but the HPC arena isn't really where AMD needs to shine at the moment. The much bigger deal is consumer software. After all, the basic concept behind APUs is that they can speed up software using the GPU core, and that they're used in consumer-friendly CPUs with integrated graphics. Without optimised consumer software, the APU will simply become a normal CPU with integrated graphics, and that may not be enough for AMD realistically to compete with Intel's latest Sandy Bridge chips. Will any of the 50 apps that AMD promises this year offer anything decent for consumers?

'Some of them are very big names in the PC market,' says Hegde, but he can't reveal any of the names ahead of the announcements. 'The focus areas that we have for the Fusion APU



Nvidia's GF100 Fermi architecture features scalar stream processors, so code ported from CUDA to OpenCL won't require much optimisation.

Will PhysX move to OpenCL?

Nvidia has no plans to port PhysX from CUDA to OpenCL, so you'll still need an Nvidia card to enable smoke effects in Batman: Arkham Asylum.

One of the major selling points of Nvidia's CUDA technology for gamers is GPU-accelerated PhysX. Already used in a variety of games, including Mirror's Edge, Batman: Arkham Asylum and Mafia II, it enables owners of Nvidia G80-series GPUs and above to gain access to advanced physics eye candy.

There's just one problem – it only works on Nvidia GPUs, which automatically creates a barrier to developers if they want to introduce gameplay-changing physics, as it instantly cuts off half the potential market.

Nvidia has hinted at the possibility of porting PhysX to OpenCL before, enabling it to run on all supporting hardware, so we asked whether this might be on the cards soon. However, our wonderings were soon put in their place when Nvidia's director of product management for PhysX, Nadeem Mohammad, simply told us that 'there are currently no plans for Nvidia to switch PhysX from CUDA to OpenCL.'

He explains that 'CUDA can be updated with new features in parallel to new GeForce GPU releases,' which is the advantage of Nvidia having complete control over its API. He also claims that Nvidia's 'development partners require any GPU acceleration we provide to be fully validated and tested on all compatible GeForce GPUs.'

There are other concerns too, of course, such as the support costs associated with sharing your API with other GPUs over which you have no control. It's also worth noting that AMD has no interest in enabling CUDA on its own GPUs, for the same reason that Nvidia wants to keep pushing it. Basically, Nvidia has complete control over CUDA.

AMD's Manju Hegde explains that 'having to take somebody else's API, especially a competitor's API, would make engineering a nightmare. Nvidia controls the API and there are architectural differences between AMD and Nvidia platforms – it isn't as if we have a common x86 instruction set, so it isn't like AMD and Intel on the CPU side – this is a completely different instruction set, and AMD would be foolish to license that.' However, Hegde says that AMD would be quite happy to support PhysX if it were ever ported over to OpenCL.

Either way, it doesn't look as if Nvidia plans to open PhysX to the OpenCL community any time soon, but it's worth noting that Bullet Physics can already be hardware-accelerated via both CUDA and OpenCL. For more information about AMD's work with Bullet Physics, read our AMD Talks GPU Gaming Physics article at **www.bit-tech.net**, in which Manju Hegde discusses AMD's physics strategy in full.

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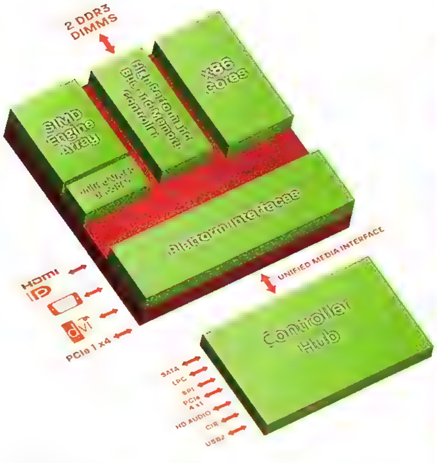
PC DIY	08 8410 0446

are actually the Internet and HD video, and when I say HD video I mean full 1080p, Blu-ray, DivX, and then we have media creation, video editing and photo editing.'

Interestingly, Hegde also says a future use of OpenCL will be gaming, and not just in terms of GPU-accelerated physics effects. 'As a vendor of graphics cards, we obviously have a lot of high-end games that use our GPUs,' explains Hegde, 'but the GPU is essentially a part of our processor, which means that it's going to have extremely wide distribution, so we're also targeting what you'd call mainstream games. That means browser-based games in which graphics don't have to be of the highest quality. These are the games for the Fusion platform, in addition to the traditional 3D games that we target with our GPUs.'

It's all very well saying that you'll work with developers, market your technology effectively and introduce a computing revolution, but it's worth noting that AMD and ATI have often failed to support their new technology. In 2009, AMD demonstrated GPU-accelerated Havok physics, but there's no sign of that now. Similarly, AMD's Brook+-based Stream SDKs were used by a tiny number of developers compared with CUDA, while the company's CrossFireX and Eyefinity technologies are still prone to severe compatibility issues.



The SIMD Engine Array is a key component of AMD's new Fusion APUs, but AMD will need widespread OpenCL support in order for this to be worthwhile.

AMD can't afford to repeat any of this with OpenCL – software developers have to use it if the company wants its Fusion APU architecture to work, and this will mean creating quality developer tools, as well as supporting developers with optimisations. As Bihan explains, 'Generally speaking, Nvidia is really well known for the quality of the software tools it develops, while it's harder with AMD.'

As Bihan explains, "Nvidia is really well known for the quality of the software tools it develops, while it's harder with AMD."

There's clearly potential demand for OpenCL software. After all, the ability to run GPGPU software on any manufacturer's GPU immediately widens the available market. 'I know that we have customers who are already interested in OpenCL,' says Bihan, 'as it doesn't bind them to specific hardware.' However, he adds that 'actually CUDA is simpler than OpenCL and the compiler is a more mature tool'.

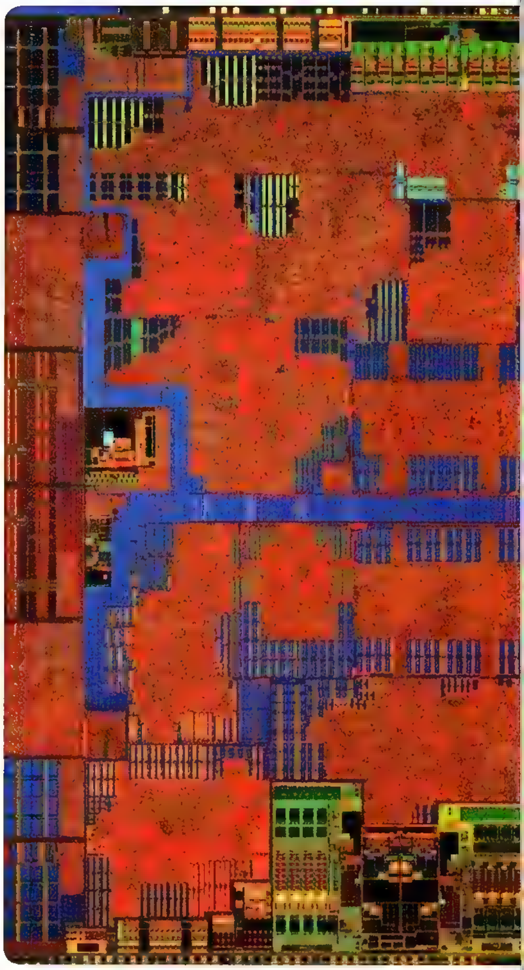
Why it's crucial to support developers

As we've established, GPGPU software developers can't simply port their code over from CUDA to OpenCL and automatically make it run optimally on every GPU out there – the process requires a lot of tweaking. CAPS has already started experimenting with OpenCL, and says it can basically compute the same functions in the CUDA and OpenCL versions of its software. However, Bihan crucially notes that 'on Nvidia GPUs, the performance is almost the same, while on ATI, it's another thing – we need to release another program actually, because we need to include other optimisations for the ATI hardware'.

Of course, Nvidia isn't just pushing CUDA – it's also supporting developers who want to use OpenCL. 'Developers can become part of our registered program,' says Nvidia's director of product management for PhysX, Nadeem Mohammad. 'Membership provides early access to drivers with the latest OpenCL standards, and we also host periodic OpenCL webinars. Any developers who are interested can apply for membership of our program at **www.nvidia.com/paralleldeveloper**.'

In fact, Hegde even thinks that many CUDA apps will eventually have to be ported to OpenCL, just because of market forces. 'I think a lot of the CUDA applications, not just PhysX, will be ported to OpenCL,' says Hegde, 'because Nvidia isn't a big enough company to take an API and make a whole industry drive towards it. I think it made sense when there was no competing API, and developers were looking for something new to improve their performance, but today there's a very viable OpenCL offering from us.'

'Nvidia has a pretty good OpenCL SDK, and it recognises that it needs to be in both camps. I think CUDA will still be widely used, and Nvidia has made a lot of traction there, but I think it would be very unlikely for a mainstream developer to use only CUDA and exclude more than 50 per cent of the market.'



Conclusion

OpenCL clearly has the potential to push GPGPU computing into the mainstream, but making this happen is more than just getting developers to parallelise their code. With different GPU architectures requiring different optimisations, OpenCL's success depends on Nvidia and AMD's ability to provide quality tools and support for developers, and this is currently lacking compared with CUDA.

Of course, Nvidia has less motivation to do this, as its top priority is CUDA, but then OpenCL code that's been ported from CUDA doesn't appear to have major performance issues on Nvidia hardware anyway. It's AMD that will make or break OpenCL, and it's making some big claims about the resources it's putting into making it work, as well as the future software that will be available.

With support from AMD, Nvidia, ARM and even Intel, OpenCL has the potential to really improve the performance of highly parallel code across a number of architectures, but whether this actually happens largely depends on whether developers receive decent tools and support from Nvidia and AMD. Let's hope they don't mess it up.

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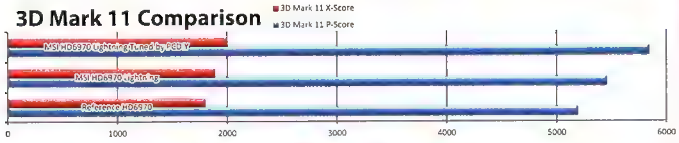

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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

A look at this month's hardware contents might have a few of you worried. It had us worried as we wrote it. To the naked eye, it probably does look a little bit short.

Here's the thing though: look at the numbers. Look at the big gap between between the page number for the head2head and the page number for Kitlog, which starts right after it. Do the maths, maybe allowing for a few of those ads we like to run to keep this place ticking.

Yes, that's right. This month's head2head goes for a massive, mind-bending, awe-inspiring 23 pages. And it's all graphics cards. A lot of graphics cards, all chucked into a system and made to fight each other to the death. Or, to the irreperable damage, anyway...

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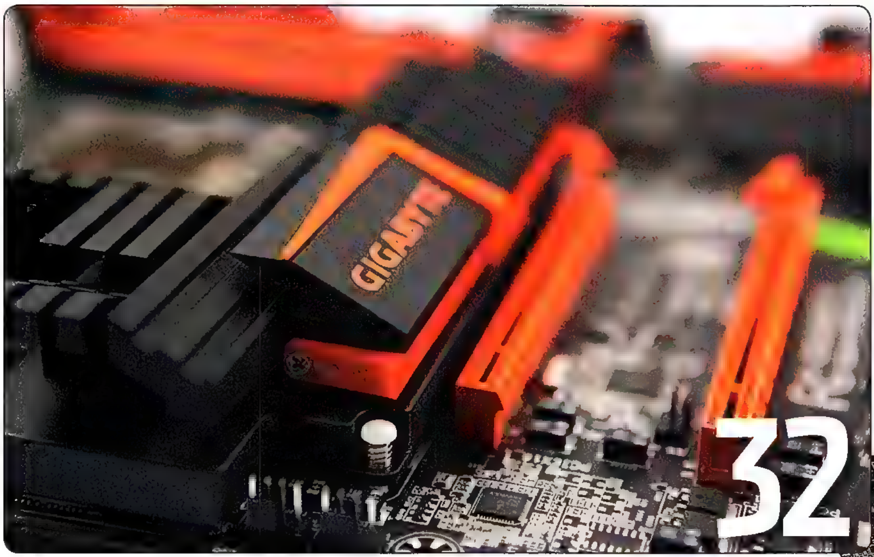
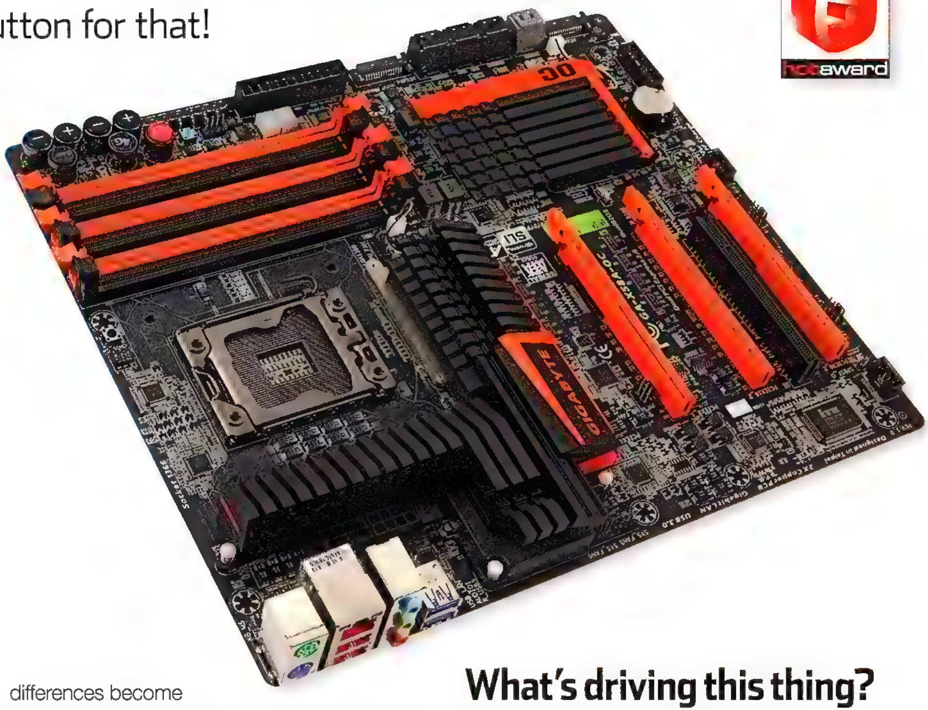


GIGABYTE X58A-OC

4GHz? Why yes, there's a button for that!

Street Price TBA **Supplier** GIGABYTE
Website http://www.gigabyte.com.au/
Specifications Socket 1366; X58 chipset; ATX form factor; 4 x PCI-e x16 (2 x 16x, 2 x 8x electrically); 1 x PCI; 6 x SATA2, 2 x SATA3; DDR3-2200

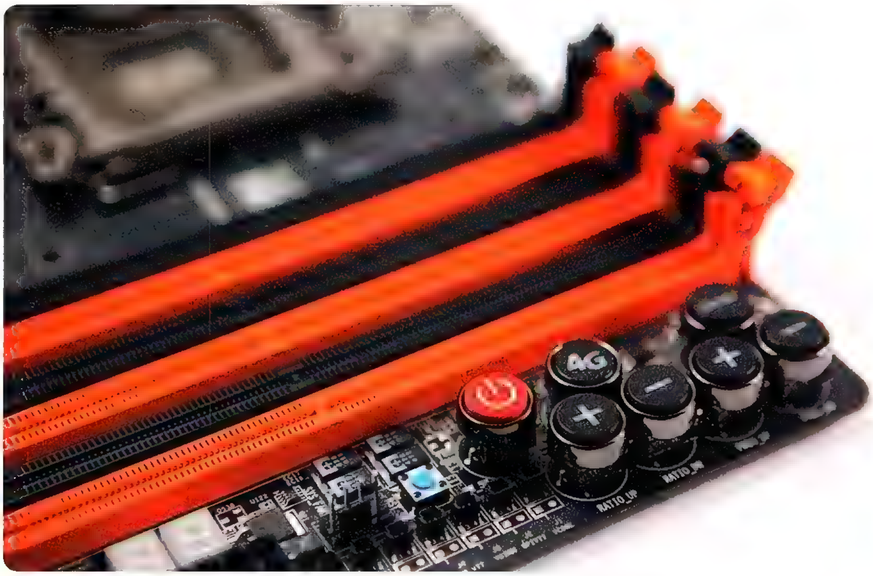


Overclocking, a once dark art practiced by the shadiest of nerds in order to conjure increased clock rates, has slowly but surely become an accepted mainstream practice. As motherboards have matured into over-engineered slabs of rock solid PCB, the ability to push them and their delicate processor inhabitants has been nothing but uncanny. Regardless of the long history of pushing hardware beyond their engineered specifications, it hasn't been until now that we've been offered a motherboard made specifically for facilitating record breaking overclock attempts. GIGABYTE has leveraged its expertise to produce the X58A-OC – and it has us very excited!

Is it pretty?

We're glad you asked, because it's quite a striking piece of kit. Bright orange highlights on the black components, specifically the various heatsinks and PCI-e slots, gives off a glorious sense of impeding danger, much like that of various venomous arthropods. Statistics have it that this sense of potentially breaking your (or a trusting friend's) expensive processing equipment improves overclocking efforts by up to 50 per cent.

But being a tad fancy isn't limited to the aesthetics! The layout of the X58A-OC looks similar to any other modern offering, however if you spy with a keen eye, some nifty little differences become apparent. Firstly, the strategic placement and usage of electrical components, such as the all solid-state Sanyo 'POSCAP' capacitors make, makes it significantly easier to apply insulation material (for sub-zero benchmarking), particularly between PCI slots. These aesthetically pleasing low profile capacitors are utilised across the entire motherboard. Additionally, despite being an ATX motherboard, the clear area around the CPU allowed us to fit the massive Noctua NH-D14 without issue! The main attraction here is the ability to mount LN2 and dry ice (DICE) pots without obstruction.



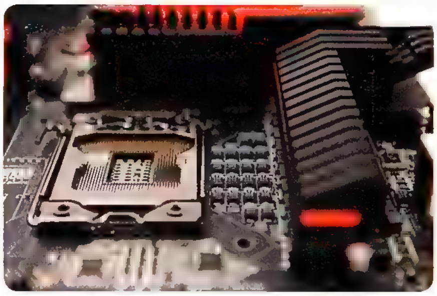
What's driving this thing?

GIGABYTE introduced a new VRM design by the name of OC-VRM, which utilises POSCAP capacitors, 50A MPFC chokes, and Driver-MOSFETs to deliver power to the CPU. Having quality components means better efficiency, reduced heat, and ultimately more useful power getting to the CPU. Via 2x 8-pin power connections, a maximum of 1500W can be input, with output to the CPU reaching an impressive 1200W. Why you'd need this much power under any circumstance is anyone's guess, but it's got all the hallmarks of e-peen, and for some people that's all that matters!

Current flow to the CPU can be controlled via an Intersil PWM (Pulse Width Modulation) module. This can be 'overclocked' from 600kHz to 1000kHz to suit power requirements under extreme conditions.

Everything's under control

This may come as a surprise, but we like buttons. Big black glossy buttons with various symbols, and the ones with '4G' printed on them... they're extra special. But this specific button is actually a toggle switch. It's story time, folks.



It all started when we first booted the motherboard. The retro BIOS splash screen greeted us as we mashed the Delete key to get into the goodness inside. After making our minor adjustments (4.5GHz minor), we hit F10 and waited for the lengthy moans and groans of the system, before finally booting into Windows... at 4GHz. That wasn't right, perhaps someone hit the special 4GHz button? So off we went back into the BIOS, readjusted our settings and rebooted. 4GHz again. After spending a decent amount of time updating the BIOS, and scratching our heads (while mumbling obscene memes such as Y U NO LIEK HERTZ?!), the problem became apparent. The 4GHz button is a bloody toggle button! So if it's lit, then expect your settings to be continuously overwritten on boot until you hit it again! Moral of the story? Don't touch buttons (also: RTFM).

But we digress. There's more buttons to play with, including two sets of '+' and '-' buttons which adjust the CPU multiplier (ratio) and BCLK respectively. A 'gear' button toggles the increments of these plus/minus buttons between 1MHz and 0.3MHz. Power, reset, CMOS reset buttons, and the ever-handy debug display are also present.

Owning an overclocker's motherboard means sacrificing the features builders often take for granted. Ports are limited to prevent overhead, so you're limited to two USB 3.0 and two USB 2.0 ports, and a single LAN port on the back panel. There are also eight SATA ports, two of which are 6Gb/s.

But does it play...

Miley Cyrus? Sure does, with its 0inbuilt Realtek ALC889 codec. Nothing particularly special, but you can't exactly listen to tunes while breaking records! But the playing we really had in mind was overclock-oriented.

With our goop-laced 990X strapped in, we aimed to topple our previous 4.8GHz achievement. Naturally, we dived straight into 4.8GHz, and tweaked our voltages to get it Prime95 stable at 1.487v (1.475v idle, 1.502v load). QPI voltage was set to 1.275v to achieve this, with level 2 LLC. Being an overclocker's board, we pushed as far as we could manage. We finally broke 4.9GHz stable at a sizable 1.55v vCore without touching the QPI voltage. Nice!

We're glad this board has a very specific market in mind, because it makes it much easier to recommend. If you're looking at getting your best shot at breaking some records, then you simply cannot look past this board. We're hearing that this will retail at around $400, so while it's not cheap, it's a fair price to pay for what is essentially the board for overclocking on the X58 platform. Now, to source some LN_2...

VC

GIGABYTE X58A-OC

Intel 990X	136x36; DDR3-1600 9-9-9-24	136x36; DDR-1904 10-10-10-24	133x32; DDR-1866 10-10-10-24
PiFast	17.67s	17.61s	20.09
wPrime 32M - single thread	26.583s	26.722s	30.608s
wPrime 32M – multi-thread (HT on)	3.618s (7.35x efficiency)	3.634s (7.35x)	4.164s (7.35x)
CineBench R10 64bit - single thread	6820	6831	6044
CineBench R10 64bit - multi-thread	38218 (5.6x efficiency)	38701 (5.67x)	33394 (5.53x)
Everest Read	14727MB/s	15614MB/s	15183MB/s
Everest Write	13035MB/s	13520MB/s	13108MB/s
Everest Latency	54.7ns	53ns	54.6ns

Performance	Overclocks like a boss.	100
Value	Who needs extra junk, anyway?	60
Features	Breaks records, not the bank.	85
Build	A well designed piece of kit.	100

Overall
Not a board for everyone, but for the targeted market, it is simply excellent.

95%

MSI Big Bang Marshal

In the beginning, there was MSI.

Street Price $519 **Supplier** MSI
Website http://au.msi.com/
Specifications Socket 1155; P67 chipset; XL-ATX form factor; 4 x PCI-e x16 (2 x 16x, 2 x 8x electrically); 4 x PCI-e 1x; 4 x SATA2, 4 x SATA3; DDR3-2133(OC)

Military Class II. Sounds pretty swanky, doesn't it? That's the claim MSI stamps onto its motherboards, describing the longevity and reliability of the components which make it up. It's all about solid state, starting with the capacitors and their ten year lifespan – we're sure it'll get replaced well before that! Hi-c CAPs made from Tantalum, and Super Ferrite Chokes (SFC) tick off the remaining Military requirements. Atteeention!

'Massive' describes this board precisely. It's an XL-ATX design, with similar aesthetics to the new MSI Z68A-GD80 bar an extra heatsink on the Lucid HYDRA chip. In fact, they have quite a bit in common. Layout is very similar with the exception of small things like the CMOS battery and on/off/OC Genie button position.

We overclocked the Big Bang Marshal to 5GHz immediately, with voltages we knew were overkill, then started winding them back. With LLC set to 'low vdroop' in ClickBIOS (there's only one level of LLC), we noticed that 1.5v would be reported by CPU-Z as 1.56v load and 1.512v idle. That's quite a jump! Toning down vCore to 1.45v also saw a large boost under load with 1.456v idle and 1.504v load. Effective load line calibration should be giving us a value close to 1.45v!

In the end we settled with 1.39v which gave us 1.4v idle, 1.44v load, Prime95 stable. Unfortunately, just as the Z68A-GD80 didn't want to play nice with our RipJaws, neither did the Big Bang Marshal, so we resorted to lower latencies instead of higher clock rates. The result? Pretty much identical results between the two boards in our benchmarks, as you can see by comparing the results in the table below.

This doesn't surprise us. The gap between the high and low end is becoming negligible for anything but competitive overclocking. Fortunately the Marshal has other attractions to lure consumers to their products, namely, their bundle.

Two USB 3.0 brackets, each with a pair of USB3.0 ports are supplied, including M-Connectors, 2-way SLI connector, SATA cables, an eSATA bracket with two ports, and various power cables. MSI's OC Dashboard is also included, which allows the modification of the BCLK and multiplier with various readings on the LCD screen. The quality of said unit is terrible; it feels and looks cheap, but it does the job.

Competition is rife in the top end, which may explain why MSI tried to differentiate itself with a Lucid Hydra chip to get around the bandwidth limitations of the P67 chipset – GIGABYTE and ASUS have opted for the NF200 chip instead. The reality is, the NF200 is the better solution in majority of situations. The Hydra will allow quad-Crossfire at 8x-8x-8x-8x, but only 2-way SLI! Note that although this motherboard appears to have eight 16x expansion slots, four of those are only 1x electrically!

On the bright side, you'll never be short on ports. The rear I/O panel houses eight NEC powered USB 3.0 ports, two USB 2.0 ports, FireWire, two Gigabit LAN ports, two eSATA ports, audio jacks powered by a Realtek LAC892, and a clear CMOS button. Eight SATA ports, four of each 3Gb/s and 6Gb/s, are situated along the edge of the motherboard.

Enthusiast features of the board include four PEG switches, to debug GPU configurations without resorting to replacing cards constantly. The 24-phase power design boasts superior power delivery to the CPU, whilst OC Genie functionality gives you an immediate 4.2GHz overclock. V-Check points are handily available to ensure CPU-Z is giving you sane readings.

Judging the motherboard individually, we'd say that it's a good product, with a slightly inflated price tag, with the unfortunate choice of a Lucid Hydra over Nvidia's NF200. However when pitted against the likes of the cheaper P67A-UD7 and Maximus IV Extreme, we can't help but expect more for the price-tag. That, and the fact that their newer, smaller, MSI Z68 based board can match on the overclocking front.

VC

MSI Big Bang Marshal

Intel 2600K	100 x 50; 1866MHz 8-9-8-24	100 x 40; 1866MHz 8-9-8-24	100 x 35; 1866MHz 9-9-9-24
PiFast	14.79s	18.44s	21.07s
wPrime 32M - single thread	28.016s	35.02s	39.996s
wPrime 32M – multi-thread (HT on)	5.179s (5.41x efficiency)	6.427s (5.45x)	7.33s (5.46x)
CineBench R10 64bit - single thread	8319	6673	5819
CineBench R10 64bit - multi-thread	32518 (3.91x efficiency)	26159 (3.92x)	23238 (3.99x)
Everest Read	22978MB/s	21678MB/s	20592MB/s
Everest Write	24784MB/s	20563MB/s	18342MB/s
Everest Latency	38.1ns	40.2ns	42.7ns

Performance 80
Identical to the Z68A-GD80.

Value 90
More goodies than a party bag.

Features 65
Too expensive for P67.

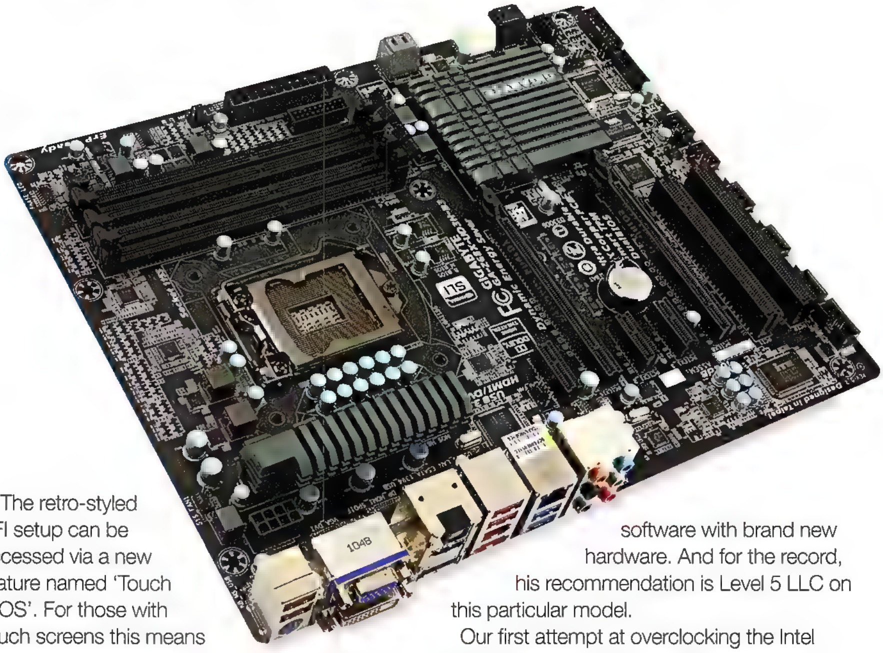
Build 75
Solid, but not fantastic.

Overall 82%
Sound bundle and board, but expensive!

GIGABYTE Z68X-UD3H-B3

P67 is sooo yesterday!

Street Price $195 **Supplier** GIGABYTE
Website http://www.gigabyte.com.au
Specifications Socket 1155; Z68 chipset; ATX form factor; 2 x PCI-e x16 (1 x 16x, 1 x 8x electrically); 3 x PCI-e 1x; 2 x PCI; 3 x SATA2, 4 x SATA3; DDR3-2133



Perhaps it's just us, but we never did understand the reasoning behind having separate chipsets for P67 and H67 functionality. The former unleashes the power of the 'K' series processors, by allowing overclocking and high speed memory. The latter cannot be overclocked and is limited to 1333MHz memory, but can tap into the on-die GPU. Why can't we overclock and have an active on-die graphic processing unit concurrently? Whatever Intel's reasoning, the solution has finally arrived, and it comes in the form of the Z68 chipset!

The Z68 chipset isn't just a hybrid product of its existing siblings, it brings to the table a nifty feature – SSD caching. This involves automatically moving commonly accessed data from a HDD onto a high speed (typically low capacity) SSD drive. What this achieves is a good mix between cost effectiveness and performance, something that neither HDDs nor SSDs are capable of individually.

Gigabyte's strategy regarding the new chipset is to completely replace P67. This makes sense, why support two chipsets when one is a crippled clone of the other? And this is where the Z68X-UD3H-B3 comes into play as GIGABYTE's new low-end Sandy Bridge board.

We're suckers for sleek design. To see a simple matte black motherboard without flashy heatsinks is a wonderful thing, and to see it on what's considered a cost effective model is very welcome. The layout is tidy, and if you have low-profile memory, you can whack in massive air coolers without encountering problems.

You won't get handy onboard controls with this board, but there's plenty of connectivity. Four USB 2.0, two USB 3.0 on the back panel, HDMI, DisplayPort, D-Sub, DVI-D, 3Gb/s eSATA, plus the usual 7.1 channel 3.5mm TRS audio jacks.

The retro-styled EFI setup can be accessed via a new feature named 'Touch BIOS'. For those with touch screens this means you can overclock with a press or two of your finger, via Windows. We're sure that all three people with touch screens and a will to fiddle with their setup are thrilled right now! On a more serious note, one new feature we absolutely love is the warning when booting in IDE mode with an AHCI capable HDD. This is a common cause of BSOD during overclocking, particularly after clearing the CMOS.

Unfortunately we didn't get a retail package, so we can't tell you if it comes with any goodies. We hypothesise that it'll be similar to the P67A-UD3-B3.

Our initial overclocking attempt had us worried. With a voltage of 1.5v in the BIOS and Level 3 LLC (out of a total of 10 levels of LLC), CPU-Z reported a voltage of 1.1v idle and fluctuation between 1.27v and 1.6v during Prime95! Experience dictates that this is far from normal, even if it isn't a board aimed at enthusiasts. After contacting overclocker extraordinaire Dino from GIGABYTE, we determined the fault lied with CPU-z itself, as you'd expect when using software with brand new hardware. And for the record, his recommendation is Level 5 LLC on this particular model.

Our first attempt at overclocking the Intel 2600K hit a hard wall at 4.8GHz stable at a voltage of 1.5v and Level 3 LLC. We could boot at 5GHz, but Prime95 would cause an immediate reboot upon starting a Blend test. We then tried increasing the LLC to level 5 but had similar issues. It turns out that you must increase the PWM and current protection settings to get a stable 5GHz – we crudely raised them as far as they could go. In the end we settled with 1.5v to get our 5GHz. With tweaking, it should be possible to reduce that voltage further.

To our surprise, the Z68X-UD3H edges ahead of the ASUS Sabertooth in PiFast and wPrime with the same configuration (possibly due to small BCLK discrepancies). There's no doubt that this board is a capable of overclocking and performing to a high degree. You probably won't break records on it, but that's a high expectation from a budget board. **VC**

Performance
Yet another excellent board.
90

Value
Absent.
??

Features
Under $200, woot!
85

Build
Typical Gigabyte quality.
90

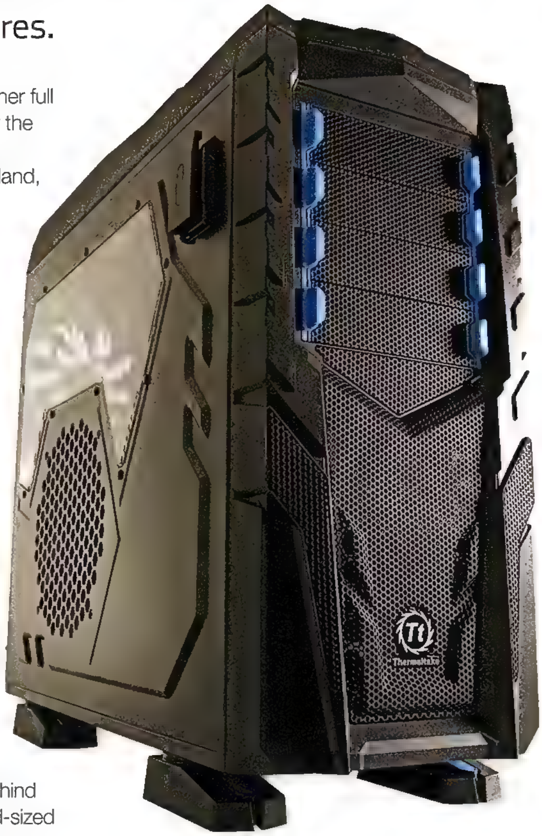
Overall
A quality product with a large upgrade path.
88%

GIGABYTE Z68X-UD3H-B3

Intel 2600K	100x48; DDR3-1866 9-9-9-24	100x40; DDR3-2133 9-9-9-24	100x50; DDR3-2133 9-9-9-24
PiFast	15.32s	18.27s	14.70s
wPrime 32M - single thread	29.016s	34.834s	27.862s
wPrime 32M – multi-thread (HT on)	5.366s (5.04x efficiency)	6.442s (5.04x)	5.195s (5.36x)
CineBench R10 64bit - single thread	7830	6621	8401
CineBench R10 64bit – multi-thread (HT)	32117 (4.1x efficiency)	26823 (4.05x)	33281 (3.96x
Everest Read	22620MB/s	23373MB/s	25194MB/s
Everest Write	24126MB/s	21074MB/s	25494MB/s
Everest Latency	39.7ns	37.7ns	35.8ns

ThermalTake Chaser Mk-1

A big blue chassis hides some rather interesting features.



Street Price $180 **Supplier** Anyware
Website www.thermaltake.com.au

Specifications 567.9 x 237.0 x 581.6mm (H x W x D); 1x200mm fan (front0, 1x 140mm fan (rear), 1x 200mm fan (top); 4x 5.25in drive bays, 6x3.5in drive bays, one dock; 8x expansion slots; 2x USB 3, 2x USB 2, 1x eSATA, mic & speaker; m-ATX, ATX; 11.6kg; SECC construction.

One of the interesting challenges of case design is how to be bold and unique, but still appeal to a broad range of PC builders. Go too far down the path of idiosyncrasy and you end up appealing to a smaller and smaller subset of users; don't go far enough, and you risk wallowing amongst the shallow end of the PC chassis genepool.

ThermalTake's decided to walk the longer path, and has come up with an atypical choice of accent colour, coupled with some great features and aggressive design. We suspect that this isn't a case for everyone – and, to be honest, not one that we'd likely build in – but it's a pretty good choice if you like harsh angles and the colour blue.

The front fascia is all angled mesh, accented by acute cut-outs down the edges and a slightly beaky protuberance along the top. If you had to compare it to anything, the angles are kind of reminiscent of the stealth bomber. It's all black, except for blue highlight on the front drive bays – these also serve as a very easy pinch-and-release mechanism to reveal the bays behind. The top panel continues the angular approach, and features a mesh inset over a 200mm exhaust fan, with a big power button and a good array of IO options and fan controls. It also pops off allowing access to the upper fan mounts.

There's even a HDD dock, that'll fit either full size drives or SSDs. A great inclusion for the price-point.

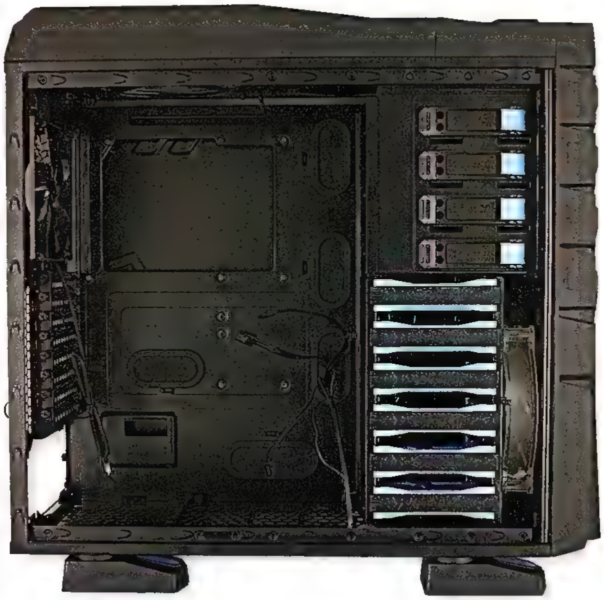
The right-hand sidepanel is typically bland, while the left-hand one features a side-window (again, very angular), another mesh inset for an optional fan, and a neat little touch – a fold out headset rest. You're more or less screwed if you like to compute away with your rig to your left, but otherwise it's handy, and saves you hanging your cans on passing friends, pets or dustbunnies.

The rear panel is cut through with more mesh (even the expansion covers are meshed), and three water-cooling inlets. It's all quite well made, though the case feet – which fold out and lock into a number of positions – are little too big, blue and over-designed. Locked in place, it kind of looks like your case is wearing giant robot clown shoes.

The internals are much cleaner and simpler, and about our only complaint is a lack of rubber mountings for the PSU. Otherwise, you've got great clearance behind the motherboard tray – which has a good-sized CPU cutout – and awesome cable-management. There are cutout cable runs around the tray, and these are all nicely rubber-grommet protected to keep your cables safe and sound.

Drives are secured by two tool-less options: HDDs are kept in slide-out caddies, while a push-button mechanism (admittedly, a little flimsy feeling) keeps ODDs in place. There are more blue highlights on these drive bays, so we suspect that if you can source hardware similarly cerulean you'll end up with quite a striking view through that side window.

And all of this comes at a pretty competitive price. There's a lot of plastic construction, of course, so it's not going to take well to too much movement or bumps, but it looks the part and has some great features. **DH**



Build	Well made, though some parts are fragile.	86
Value	A good price for what you get.	89
Cooling	Good at stock, with lots of options for more.	91
Features	Just about everything you could want.	93
Overall	Idiosyncratic, but well made and outfitted.	89%

DF-SERIES

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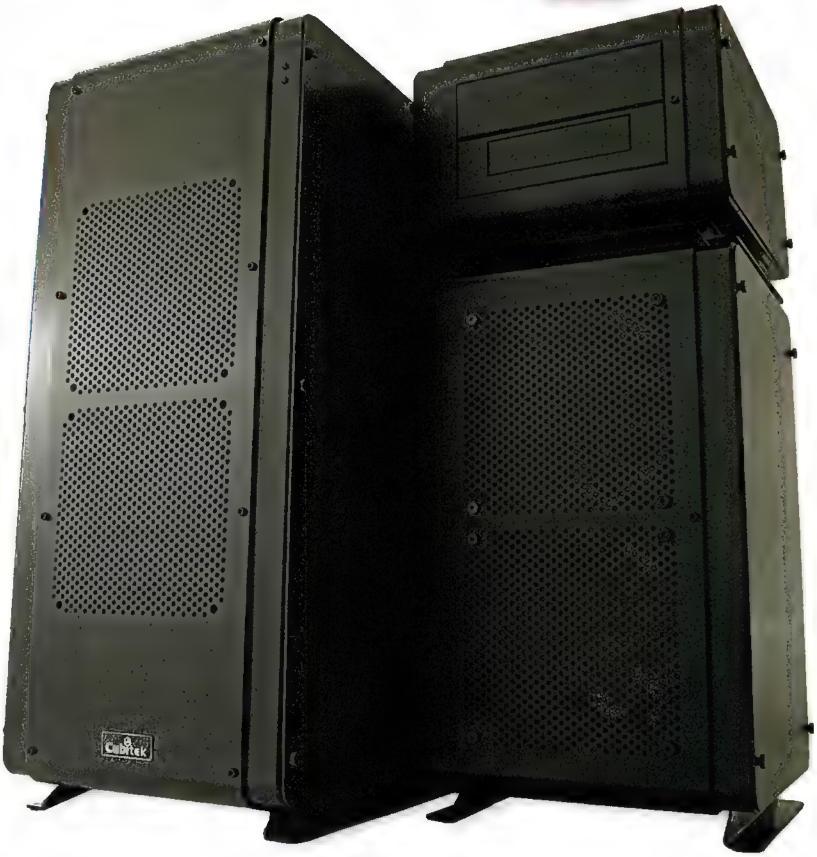
Cubitek Magic Cube

A truly innovative modular design wins our seal of approval.

Street Price $285 **Supplier** Cubitek
Website www.cubitek.com

Specifications Motherboard Cube: 1x 140mm fan (rear), 1x 120mm fan (top), 1x 140mm fan (front); HDD Cube: 2x 140mm fan (front); 4x 5.25in drive bays, 8x 3.5in drive bays, 2x 2.5in drive bays; 8x expansion slots; ATX and E-ATX; anodized aluminium.



Have you ever seen that magic trick where the beautiful assistant gets into some case-like arrangement, with head poking out one end, and feet the other? You know, the one where the magician saws them in two or three pieces... but the assistant comes out fine? That's kind of the trick that Cubitek's Magic Cube case pulls off, by separating your prized PC possession into three still-working pieces.

It's an elegant and supremely practical trick of modular design, and one we can't help but really dig.

Split infinitives

We've seen single-case modular designed before – ThermalTake's Level10 case comes to mind – where various PC parts have been housed in their own enclosures or chambers. The idea is that you then don't get heat leakage between, say, HDDs and your motherboard.

The Magic Cube takes that idea one step further, and is in fact three distinct and separate enclosures, designed to be stacked or stored away as your workspace requires.

Each part uses the same design aesthetic – black anodised aluminium sheets, artfully curved and reinforced.

First up, there's the motherboard enclosure, which pretty much does just that. It's the largest of the three pieces, though still far smaller than a similar, more conventional case. Next in size comes the HDD enclosure, and then the ODD enclosure, which is the smallest of them all.

Each part uses the same design aesthetic – black anodised aluminium sheets, artfully curved and reinforced. It's kind of brutalist, but in the black looks suitably aggressive. What's more, each panel and plate is secured not by rivets, but by either small thumb screws or smaller hex screws – you can pretty much take the Magic Cube completely apart. If you like detailed case-modding, or think you can improve on the Cube design, it's a real plus. The modules are even designed so they can attached to one-another. By removing the rubber feet on the ODD module, for instance, you can screw it onto the HDD module.

One of the things we'd think the Cube would be great for is keeping your desktop neat and tidy, by only having the ODD module actually on the desk. Or you could stack different modules to either side of your monitor, or even stack them all into one, giant uber-tower.

Aside from the convenience of how you place the modules, there's also the added ease of installation. In many cramped, high-end systems, you'll often need to remove a number of parts to get at other sub-systems. Large coolers can make it hard to get to your optical drives, while multiple GPU setups can often make getting at HDDs a pain. By separating those subsystems,

any upgrades or maintenance becomes far easier. Swapping drives in and out of the Magic Cube is simple, as you're not dealing with any clutter from PSU cables or GPUs.

Finally, there's a definite advantage when it comes to thermal properties. Most cases bring in cool air in the front, which first must pass over HDDs before then moving into the GPU/CPU area – not so in the Magic Cube. And with less parts in each enclosure, airflow is also simpler, and there's less obstacles for dust and grit to build up on.

It's an elegant solution across the board – pun intended. Also, yes, the Cube comes with all the extra cabling you'll need to make sure all the modules are properly connected.

Inner thoughts

The internal design of the two drive modules is pretty much what you'd expect from the exterior. There are racks for drives fitted with included rubber grommets, and runs for cabling to be lead out the top or bottom of each enclosure, depending on how your modules are going to be set up. Like the external design, pretty much every internal bracket is secured by screws rather than rivets, so there's a lot of internal build options too.

In terms of drive cooling, there are two 140mm fans that draw in air straight over the HDDs, but no fan in the ODD enclosure, unsurprisingly.

The motherboard enclosure features a wonderfully clean interior. The mobo tray itself is studded with both a cutout for the CPU cooler, and cable runs, which should make cabling the case a breeze. There's even a good amount of clearance behind the tray, too. The PSU mounts are coated in rubber strips to stop vibration, and all the fans are similarly dampened. The other advantage of keeping drives and motherboard separate is you're not going to get any strange harmonics from when you boot a CD or access your hard drive.

The size of this module does have some limitations, though. You're limited to a maximum video card length of 340mm, and a CPU cooler height of 180mm – it's not a huge imposition, but one to be aware of.

We've few other issues with the Magic Cube. The thumb screws used to secure many of the panels are touch on the small side, but really, that's about it. Each part is well-finished and machined, though there are some parts that require a little finessing to secure back into place once you've finished tinkering. That said, we may have a non-retail sample, but it's something to be aware of regardless.

By and large, though, we really like this take on modular computing. If you're looking for something unique for your next build, that offers excellent design and a lot of build options, the Magic Cube might just be the trick you're searching for. **DH**

Build Well made, though some panels are tight.	89
Value Not a bad price for the design options.	87
Cooling Good fan placement, going modular helps.	92
Features Only hot-swaps could improve the Cube.	93
Overall An excellent option for the builder looking for inspiration.	91%

GRAPHICS CARD MEGATEST

With so many great games just out or coming soon, now is the time to upgrade and get ready.

Building a balanced PC is always important, but it's even more essential to cater your build to your needs. If you're interested in gaming, it's the graphics card you need to pay most attention to. The underlying technology of these cards moves at a furious pace, so choosing which one is best for your budget is always tricky.

We've come to the rescue with this comprehensive megatest of every new card, and a load of previous-generation cards, so that you can see whether it's really worth upgrading or not. After all, it's pointless spending any amount of money if you're not going to get the gains you expect. In total, we've tested and re-tested 22 graphics cards and run each one through a gruelling suite of benchmarks to separate the underpowered GPUs from the gaming powerhouses. We've also got Folding results for those who are more interested in science than fps, and the full complement of power consumption and temperature results too.

Whether you're in the market for a graphics upgrade or you're building your first PC, this Head2Head is essential reading.

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Feature Table

	AMD Radeon HD 4870 1GB	AMD Radeon HD 5770 1GB	AMD Radeon HD 5850 1GB	AMD Radeon HD 5870 1GB	AMD Radeon HD 5970 2GB
Typical Street Price	No longer on sale	$120	$200	$270	No longer on sale
Manufacturers Website	www.amd.com.au	www.amd.com.au	www.amd.com.au	www.amd.com.au	www.amd.com.au
GPU					
Frequency (MHz)	625MHz	850MHz	725MHz	850MHz	725MHz
Stream processors (frequency)	800 (750MHz)	800 (850MHz)	1,440 (725MHz)	1,600 (850MHz)	2 x 1,600 (725MHz)
Layout	10 SIMD Engines	10 SIMD Engines	18 SIMD engines	20 SIMD engines	2 x 20 SIMD engines
Texture units	40	40	80	80	2 x 80
Rasterisers	None	1	1	1	2 x 1
Tessellation units	1	1	1	1	2 x 1
Render outputs (ROPs)	16	16	16	32	2 x 32
Size	256mm²	166mm²	334mm²	334mm²	2 x 334mm²
DirectX support	10.1	11	11	11	11
Fabrication process (nm)	55	40nm	40nm	40nm	40nm
Transistors	956 million	1.04 billion	2.154 billion	2.15 billion	2 x 2.15 billion
Memory					
Amount (type)	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	2 x 1GB GDDR5
Effective frequency	3.6GHz	4.8GHz	4GHz	4.2GHz	4GHz
Interface	256-bit	128-bit	256-bit	256-bit	2 x 256-bit
Bandwidth	115GB/sec	76.8GB/sec	128 GB/sec	134.4GB/sec	2 x 128GB/sec
Card specifications					
PCI-E power connectors	2 x 6-pin	1 x 6-pin	2 x 6-pin	2 x 6-pin	1 x 6-pin, 1 x 8-pin
Maximum power draw	160W	108W	151W	188W	294W
Recommended PSU	500W	450W	500W	500W	600W
CrossFireX/SLI compatible	Crossfire	CrossFire	CrossFireX	CrossFire	CrossFireX
Slots, length	Dual, 240mm	Dual, 215mm	Dual, 240mm	Dual, 282mm	Dual, 309mm

	Nvidia GeForce GTX 260 (rev 2) 896MB	Nvidia GeForce GTX 450 1GB	Nvidia GeForce GTX 460 768MB	Nvida GeForce GTX 460 1GB	Nvidia GeForce GTX 470 1.3GB
Typical Street Price	No longer on sale	$140	$200	$210	No longer on sale
Manufacturers Website	www.nvidia.com	www.nvidia.com	www.nvidia.com	www.nvidia.com	www.nvidia.com
GPU					
Frequency (MHz)	576	783MHz	675MHz	775MHz	607MHz
Stream processors (frequency)	216 (1,242MHz)	192 (1,566MHz)	336 (1,350MHz)	336 (1,350MHz)	448 (1,215MHz)
Layout	9 TPCs	4 SMs, 1 GPC	7 SMs, 2 GPCs	7 SMs, 2 GPCs	14 SMs, 4 GPCs
Texture units	80	28	56	56	56
Rasterisers	None	1	2	2	4
Tessellation units	None	4	1	1	14
Render outputs (ROPs)	28	16	24	32	40
Size	487mm²	238mm²	332mm²	332mm²	530mm²
DirectX support	10	11	11	11	11
Fabrication process (nm)	65nm	40nm	40nm	40nm	40nm
Transistors	1.4 billion	1.17 billion	1.95 billion	1.95 billion	3 billion
Memory					
Amount (type)	896MB GDDR3	1GB GDDR5	768MB GDDR5	1GB GDDR5	1.2GB GDDR5
Effective frequency	1.998GHz	3.608GHz	3.6GHz	3.6GHz	3.2GHz effective
Interface	448-bit	128-bit	192-bit	256-bit	320-bit
Bandwidth	112GB/sec	57.73GB/sec	86GB/sec	115GB/sec	134GB/sec
Card specifications					
PCI-E power connectors	2 x 6-pin	1 x 6-pin	2 x 6-pin	2 x 6-pin	2 x 6-pin
Maximum power draw	182W	106W	150W	160W	215W
Recommended PSU	500W	400W	450W	450W	550W
CrossFireX/SLI compatible	SLI	SLI	SLI	SLI	SLI
Slots, length	Dual, 267mm	Dual, 210mm	Dual, 210	Dual, 210mm	Dual, 241mm

AMD Radeon HD 6850 1GB	AMD Radeon HD 6870 1GB	AMD Radeon HD 6950 1GB	AMD Radeon HD 6950 2GB	AMD Radeon HD 6970 2GB	AMD Radeon HD 6990 4GB
$220	$260	$285	$350	$460	$800
www.amd.com.au	www.amd.com.au	www.amd.com.au	www.amd.com.au	www.amd.com.au	www.amd.com.au
775MHz	900MHz	800MHz	800MHz	880MHz	830MHz
980 (775MHz)	1,120 (900MHz)	1,408 (800MHz)	1,408 (800MHz)	1,536 (880MHz)	3,072 (830MHz)
12 SIMD Engines	14 SIMD engines	22 SIMD Engines	22 SIMD Engines	24 SIMD Engines	48 SIMD Engines
48	56	88	88	96	192
2	2	2	2	2	4
1	1	2	2	2	4
32	32	32	32	32	64
255mm²	255mm²	389mm²	389mm²	389mm²	2 x 389mm²
11	11	11	11	11	11
40nm	40nm	40nm	40nm	40nm	40nm
1.7 billion	1.7 billion	2.6 billion	2.6 billion	3.6 billion	2 x 2.6 billion
1GB GDDR5	1GB GDDR5	1GB GDDR5	2GB GDDR5	2GB GDDR5	2 x 2GB GDDR5
4GHz	4.2GHz	5GHz	5GHz	5.5GHz	5GHz
256-bit	256-bit	256-bit	256-bit	256-bit	256-bit
128GB/sec	134.4GB/sec	160GB/sec	160GB/sec	176GB/sec	2 x 160GB/sec
2 x 6-pin	2 x 6-pin	2 x 6-pin	2 x 6-pin	1 x 6-pin, 1 x 8-pin	2 x 8-pin PCI-E
127W	151W	Unknown	Unknown	250W	375W
500W	500W	500W	500W	550W	750W
CrossFireX	CrossFireX	CrossFireX	CrossFireX	CrossFireX	CrossFireX
Dual, 235mm	Dual, 250mm	Dual, 275mm	Dual, 275mm	Dual, 287mm	Dual, 305mm

Nvidia GeForce GTX 480 1.5GB	Nvidia GeForce GTX 550 Ti 1GB	Nvidia GeForce GTX 560 Ti 1GB	Nvidia GeForce GTX 570 1.3GB	Nvidia GeForce GTX 580 1.5GB	Nvidia GeForce GTX 590 3GB
$330	$175	$270	$370	$550	$900
www.nvidia.com	www.nvidia.com	www.nvidia.com	www.nvidia.com	www.nvidia.com	www.nvidia.com
700MHz	900MHz	820MHz	732MHz	772MHz	607MHz
480 (1.400MHz)	192 (1,800MHz)	384 (1,640MHz)	480 (1,464MHz)	512 (1,400MHz)	2 x 512 (1,214MHz)
15 SMs, 4 GPCs	4 SMs, 1 GPC	8 SMs, 2GPCs	15 SMs, 4 GPCs	16 SMs, 4 GPCs	2 x 16 SMs, 4 GPCs
56	28	64	60	64	2 x 60
4	1	2	4	4	2 x 4
15	4	8	15	16	2 x 16
48	24	32	48	48	2 x 48
530mm²	238mm²	332mm²	520mm²	530mm2	2 x 520mm²
11	11	11	11	11	11
40nm	40nm	40nm	40nm	40nm	40nm
3 billion	1.17 billion	1.95 billion	3 billion	3 billion	2 x 3 billion
1.5GB GDDR5	1GB GDDR5	1.28GB GDDR5	1.3GB GDDR5	1.5GB GDDR5	2 x 1.5GB GDDR5
3.7GHz	4.104GHz	4GHz	3.8GHz	4.08GHz	3,414MHz
384-bit	192-bit	256-bit	320-bit	384-bit	2 x 384-bit
177GB/sec	98.5GB/sec	128GB/sec	152GB/sec	192.4GB/sec	2 x 163.9GB/sec
1 x 6-pin, 1 x 8-pin	1 x 6-pin	2 x 6-pin	2 x 6-pin	1 x 6-pin, 1 x 8-pin	2 x 8-pin
250W	116W	180W	219W	244W	365W
600W	400W	500W	550W	600W	700W
SLI	SLI	SLI	SLI	SLI	SLI
Dual, 267mm	Dual, 209mm	Dual, 228mm	Dual, 267mm	Dual, 267mm	Dual, 280mm

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AMD Radeon 6850 1GB

Cool and quiet but only because it lacks gaming grunt.

Street Price $220
Manufacturer www.amd.com.au

The AMD Radeon HD 6850 1GB launched way back in October 2010 and shook up the mid-range of the market in the process. Six months worth of water has passed under the graphics bridge since then, though, which makes it the oldest of AMD's HD 6000-series graphics cards.

With cards currently costing around $220, the 980 stream processors of the Barts Pro GPU seem generous. These stream processors work alongside the 32 texture units which, like the rest of the GPU, run at 775MHz. Coupled to the GPU is 1GB of 1GHz (4GHz effective) GDDR5 memory, which operates on a 256-bit bus, giving a theoretical maximum memory bandwidth of 128GB/sec.

Black Ops proved no problem for the HD 6850 1GB; even at 2,560 x 1,600 with 4x AA applied, the card returned a minimum frame rate of 58fps. It was faster than the $270 GeForce GTX 560 Ti 1GB at 1,920 x 1,080 with 4x AA, but managed a lower average frame rate at the other two test settings, despite the minimums of the two cards being identical. At least the HD 5850 1GB was consistently faster than the $175 GeForce GTX 550 Ti 1GB.

The HD 6850 1GB performed poorly in Dirt 2, managing to be slower than the cheaper GTX 550 Ti 1GB at every resolution. Bad Company 2 proved too much for this card too; even at 1,680 x 1,080 you'll have to lose the AA to achieve a playable frame rate. Worse still, the GTX 550 Ti 1GB can just about the play the game at 1,680 x 1,050 with 4x AA – even a GeForce GTX 460 1GB managed a minimum frame rate of 32fps.

The card could run Arma II smoothly at 1,920 x 1,080 with 4x AA, but only just, with a minimum of 25fps. A GTX 460 1GB was 1fps slower, while the GTX 550 Ti 1Gb was considerably slower. However, an extra $50 nets you a GTX 560 Ti 1GB and a minimum frame rate of 30fps.

The HD 6850 1GB also struggled when it came to folding, as did all its Radeon cousins. The meagre 2,983ppd was the third lowest on test. At least the HD 6850 1GB didn't draw much power while it was folding – our test system drew only 213W from the wall with it installed. This number jumped up significantly to 265W when gaming, however.

Thankfully, the stock cooler of the HD 6850 1GB is easy to live with, as the relatively junior GPU means that the fan doesn't have to spin up to keep the chip cool. The HD 6850 1GB's idle delta T of 11c was the second best on test, while its gaming delta T of 37c was also towards the top of the table.

While the HD 6850 1GB performed reasonably well in Arma II, it couldn't play Bad Company 2 at our lowest test settings and was outpaced by the cheaper GTX 550 Ti 1GB in both this game and Dirt 2. While the price means that there's no direct competitor, this card just isn't worth spending the extra $45 over the GTX 550 Ti. You're better off reaching for the next step up the performance ladder and getting the GTX 560 Ti 1GB.

PAUL GOODHEAD

+ Quiet; can play some games at 1,920 x 1,080.

− Can't play Bad Company 2 without sacrificing AA; poor value.

BEST RESOLUTION

Not even

1680 x 1050

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AMD Radeon HD 6870 1GB

Still quick if you have one, but not worth buying now.

Street Price $260
Manufacturer www.amd.com.au

If you bought an AMD Radeon HD 6870 1GB at launch then you'd have paid around $350 for the large black slab of graphics processing goodness. It was a competent card, as demonstrated by the fact that prices haven't dropped too far in over six months; graphics cards usually depreciate faster than a showroom-bought Alfa Romeo.

Powering the HD 6870 1GB is the Barts XT GPU, with 1,120 stream processors zipping along at a healthy 900MHz. This means that the HD 6870 1GB is actually the highest-clocked GPU in AMD's current range. These stream processors are complemented by 56 texture units – eight more than the Radeon HD 6850 1GB – and 32 ROPs. Rounding all this off is 1GB of GDDR5 memory running at 1.05GHz (4.2GHz effective), which provides the GPU with a memory bandwidth of 134.4GB/sec.

AMD cards love Black Ops, so it was no surprise to see the HD 6870 1GB take position at the top of the graphs for this game. Even those with 30in monitors would see playable frame rates – we saw a minimum frame rate of 65fps at 2,560 x 1,600 with 4x AA. The $270 GeForce GTX 560 Ti 1GB could only manage a minimum of 58fps at the same resolution.

Bad Company 2 is a much more punishing game to run and here the HD 6870 1GB struggled slightly. Its minimum frame rate of 28fps at 1,920 x 1,080 with 4x AA was a significant 4fps slower than that of the GTX 560 Ti 1GB.

We saw a repeat of this pattern in Arma II, with the HD 6870 1GB returning a minimum of 28fps at 1,920 x 1,080. This was enough to play the game smoothly, but the GTX 560 Ti 1GB was 2fps faster, giving you a little more leeway should the action become crazy on-screen.

Dirt 2 generally favours Nvidia hardware, so it was no surprise to see the HD 6870 1GB beaten by even the $175 Nvidia GeForce GTX 550 Ti 1GB at 1,680 x 1,050 and 1,920 x 1,080. The GTX 560 Ti 1GB eclipsed the HD 6870 1GB by an even greater amount, even if the HD 6870 1GB could play the game smoothly at up to 2,560 x 1,600 with 4x AA.

The woeful 3,476ppd that we gained from the HD 6870 1GB was less than even the three-year-old GeForce GTX 260 (rev 2) 896MB, although serious folders should know not to bother with AMD cards until Stanford updates its client. Given that the HD 6870 1GB caused our PC to draw the same amount of power as with the older Nvidia card installed, you'd be foolish to buy an HD 6870 1GB purely for folding.

The HD 6870 1GB is a capable card, especially at 1,920 x 1,080, but it was only just able to play Bad Company 2 and Arma II at this resolution. This indicates that there isn't much performance left in the tank and, with so many great games coming out this year, we'd like a little insurance to make sure that they're all playable. If you already own one of these cards, however, you'll need to spend a fair amount of money to get a significant upgrade.

PAUL GOODHEAD

+ Has aged well.

− Loud when gaming.

BEST RESOLUTION
1920 x 1080

AMD Radeon HD 6950 1GB and 2GB

Both cards are decent, but the GeForce GTX 560 Ti 1GB is almost as fast and cheaper.

Street Price $285 (1GB), $350 (2GB)
Manufacturer www.amd.com.au

At the start of this year, the AMD Radeon HD 6950 2GB had this price bracket to itself, but then the Nvidia GeForce GTX 560 Ti 1GB appeared, offering comparable performance for not much more money. In response, AMD released a cheaper 1GB version of the card to undercut the 2GB version. As the two cards are identical apart from memory size, and perform very similarly, we're bundling them together on the same page.

Both cards are based on the same Cayman Pro GPU, which runs at a reasonable 800MHz. Inside this GPU are 1,408 stream processors and 88 texture units. The memory of the cards runs at the same 1.25GHz (5GHz effective) through the same 256-bit bus. This gives the two cards the same 160GB/sec memory bandwidth.

Predictably, both cards could play Black Ops and Dirt 2 at the native 2,560 x 1,600 resolution of a 30in monitor. The two cards are 5-8fps faster in Dirt 2 and 13-14fps slower in Black Ops than the Nvidia GTX 560 Ti 1GB. The 2GB version was an insignificant 1fps faster than the 1GB version.

Arma II is a sterner test for a GPU and more indicative of how a graphics card will deal with a hardcore PC-only game. The HD 6950s again perform well in this respect; the 2GB and 1GB versions managed a minimum frame rate of 33fps and of 32fps respectively at 1,920 a 1,080 with 4x AA, while the GTX 560 Ti 1GB could produce a minimum of 30fps at the same settings.

Bad Company 2 saw the GTX 560 Ti 1GB gain a lead over both cards, with a minimum of 32fps at 1,920 x 1,080 with 4x AA. The 2GB version could only produce a minimum of 30fps and the 1GB version a minimum of 29fps. This isn't terrible news for the 1GB card, as it's only $15 more expensive, but makes the $350 2GB version poor value for money.

If folding is your primary concern when looking at a graphics card then we're unsure as to why you're even reading this page. Stanford has yet to release a new folding client to better address the CAL API that AMD insists on using, meaning that folding performance is poor across all Radeon cards at the moment. Both cards managed only 4,000ppd, and were eclipsed by aging or cheap GeForce cards.

Power consumption for the two cards was, as you'd expect, similar; the 1GB version of the card caused our test PC to draw 254W when gaming, which rose to 272W with the 2GB card installed. At least the much-used reference cooler was quiet, even if the denser memory of the 2GB card caused its GPU to run a little hotter than that of the 1GB version.

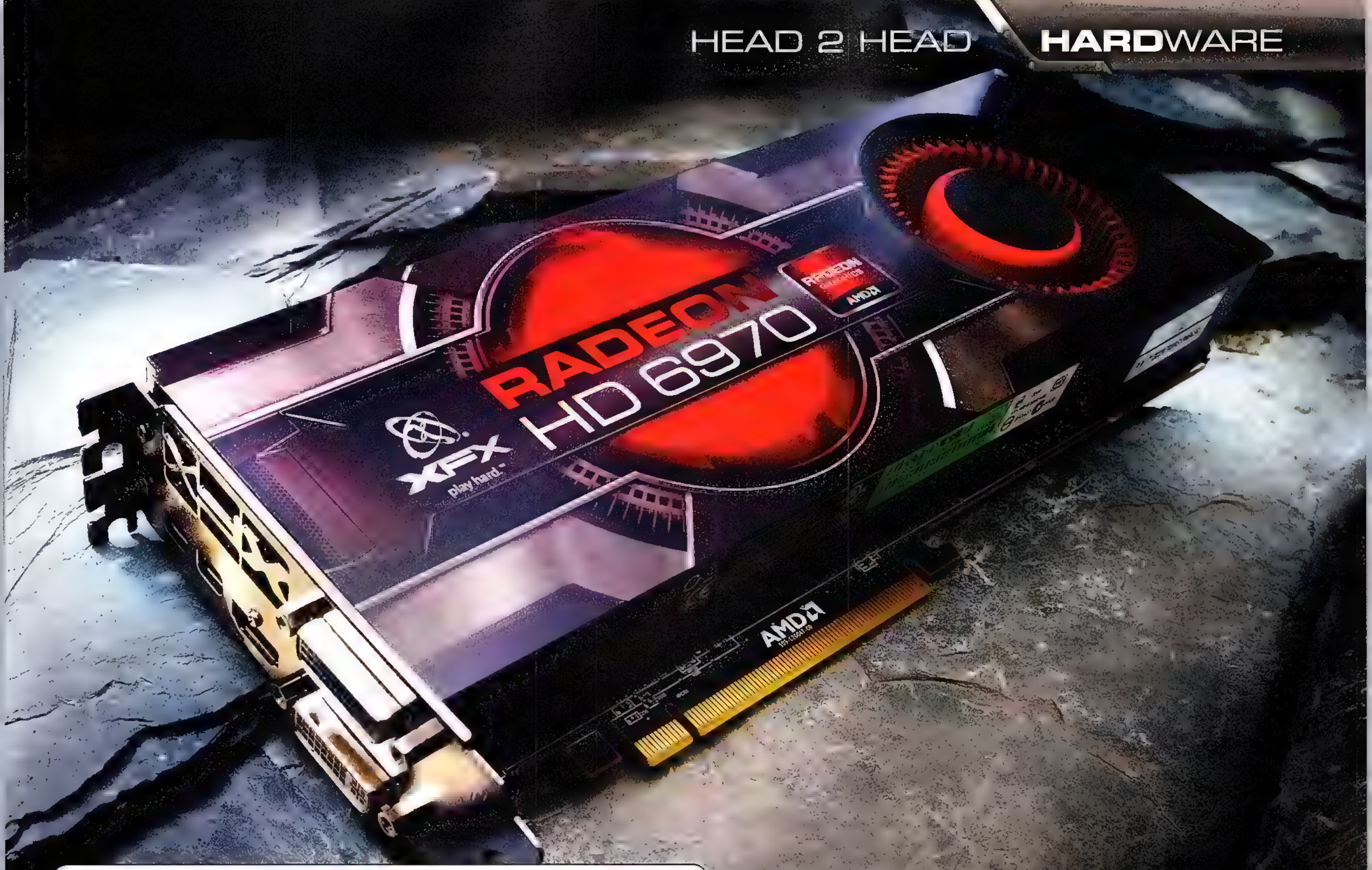
If you own an HD 6950 of either flavour then you should be pretty happy with yourself. Each card was capable of running the latest games at 1,920 x 1,080, although we didn't notice any significant difference in performance between the two versions. If you don't have a HD 6950 then it's tough to recommend buying one – the GTX 560 Ti 1GB is almost as fast and a bit cheaper.

PAUL GOODHEAD

+ Solid performance at 1,920 x 1,080; competitive price.

− 2GB version is pointless; GTX 560 Ti 1GB is cheaper.

BEST RESOLUTION
1920 x 1080



AMD Radeon HD 6970 2GB

A capable graphics card up to 1,920 x 1,080 but the GeForce GTX 570 1.3GB is better value.

Street Price $420
Manufacturer www.amd.com.au

The Cayman XT GPU of the AMD Radeon HD 6900 series is a completely different design to that of the HD 6800-series GPUs. It has two entire front-end units, which allow for twice as much work per clock to be sent to the stream processors than before. The stream processor layout has had an upgrade too – although there's 64 fewer stream processors in this GPU than in AMD's previous-generation top-end card, the Radeon HD 5870 1GB, each processor is capable of the high-precision maths that only a fifth of the HD 5870 1GB's units could manage.

AMD claims that the new layout is ten per cent faster per square millimetre of GPU die than the HD 5870 1GB. Despite the naming of AMD's HD 6000-series, this GPU actually is the successor to the HD 5870 1GB. The GPU has a frequency of 880MHz and is equipped with 2GB of GDDR5 RAM operating at 1.375GHz (5.5GHz effective) over a 256-bit memory interface. This may sound paltry compared with the 384-bit interfaces of the GeForce GTX 570 1.3GB, and the GeForce GTX 580 1.5GB, but the high memory frequency gives the HD 6970 2GB a respectable 176GB/sec of memory bandwidth.

At 1,920 x 1,080, the HD 6970 2GB traded blows with the GTX 570 1.3GB, which currently costs $40 less. In Arma II, we saw identical minimum frame rates from both cards, while Black Ops ran similarly fast on both cards, with minimums of 95fps from the Radeon and 94fps from the GeForce. The GTX 570 1.3GB raced into the lead in Dirt 2 with a minimum of 91 fps rather than 75fps, and was 4fps faster in Bad Company 2 with a minimum of 42fps.

When we increased the resolution to 2,560 x 1,600, neither the HD 6970 2GB nor the GTX 570 1.3GB could cope with Arma II or Bad Company 2. Both cards managed the same 18fps minimum in the former, while the GTX 570 1.3GB managed a minimum of 21fps compared to 19fps in Bad Company 2. We saw the usual pattern of Dirt 2 favouring a GeForce card and Black Ops favouring a Radeon card, however, and both games ran at very high frame rates on both cards.

The folding output of the HD 6970 2GB was dire, however, with just 4,328ppd generated, for a total system power draw of 294W. Even the GeForce GTX 260 (rev 2) 768MB trounced the HD 6970 2GB, and that's a three-year-old card. The GTX 570 1.3GB powered through 14,756ppd while using 10W less power than the HD 6970 2GB. The GTX 570 1.3GB may have consumed 24W more when gaming than the HD 6970 2GB, but both reference coolers were reasonably quiet for such powerful cards.

The GTX 570 1.3GB used to cost slightly more than this card, but a recent price drop by Nvidia has changed that. It's also slightly faster overall, much better at folding and now costs $40 less. If you already own an HD 6970 2GB, then only a GeForce GTX 580 1.5GB or one of the leviathan dual-GPU cards represents a significant upgrade, but it's still definitely a very capable card so we doubt you'll be retiring it any time soon.

PAUL GOODHEAD

+ Fairly quiet; great at 1,920 x 1,080.

− High power draw; runs fairly hot; terrible at folding.

BEST RESOLUTION
1920 x 1080

AMD Radeon HD 6990 4GB

It's a beast of a card, both in size and performance, but the GTX 590 1.5GB is quicker.

Street Price $800
Manufacturer www.amd.com.au

The Radeon HD 6990 4GB is a dual-GPU behemoth that measures a titanic 12 inches in length. As with previous AMD dual-GPU cards, the basis for the card is two top-end GPUs – it uses the same Caymen XT GPUs as the (single-GPU) Radeon HD 6970 2GB. However, the two GPUs operate at lower frequencies than in the HD 6970. With the HD 6990 4GB, this means that the 3,072 stream processors run at 830MHz rather than 880MHz. Similarly, the 4GB of GDDR5 memory (2GB per GPU) is clocked at 1.25GHz (5GHz effective) rather than 1.375GHz (5.5GHz effective).

By selecting such high-end, high-power GPUs, AMD has given itself a significant challenge when it comes to both powering and cooling this beast. As a result, the card breaks the PCI Express 2.0 power specification, which states that no expansion card should consume more than 300W of power. The HD 6990 4GB in its factory configuration draws up to 375W of power, and can draw up to 450W if you flick the Antilles Overclocking Switch, which increases the GPU frequency from 830MHz to 880MHz and adds an extra 0.055V to each GPU. AMD says that you automatically void your warranty by using the Antilles Unlocking Switch – which is ridiculous considering that the switch is a standard feature of all cards. Even at its default speed, though, you'll need a hefty PSU to power this card.

To deal with all the heat produced by the two GPUs, AMD has had to use phase-change thermal paste, which cures and hardens. AMD claims that improves thermal performance by eight per cent in comparison to ordinary TIM. However, we were advised that disassembling the card breaks this cured TIM, which can't be reset. Each GPU is also cooled by a vapour-chamber-based heatsink, which we've found to be extremely effective in the past.

Cooling the card's memory has also required a more complex arrangement than usual. AMD has had to mount half of the memory for each GPU on the back of the card – each GPU is serviced by eight 256MB modules, which won't all fit on one side of the PCB. As such, a backplate has been used to passively cool the memory fitted on the back of the card, and this is probably the reason why the HD 6990 4GB ships with a comparatively conservative memory speed of 5GHz (effective).

Performance

As we've already seen graphics cards that cost half the price of the HD 6990 4GB manage playable frame rates in Dirt 2, it was no surprise to see it absolutely demolish the game. Even with 4x AA applied at 2,560 x 1,600, we saw a minimum frame rate of 89fps. This increased slightly to 96fps when the Antilles Switch was enabled. Even this result wasn't enough to beat the Nvidia GeForce GTX 590 3GB, though, which returned a triple-digit minimum frame rate.

Black Ops doesn't know what to do with any of the dual-GPU cards we tested, and they all tended to achieve a minimum frame rate of around 84fps no matter which resolution we used. However, the new GTX 590 3GB managed to push past this limit at 1,680 x 1,050, so perhaps driver updates will resolve this. All of this is moot, though, as a minimum frame rate of 81fps at 2,560 x 1,600 with 4x AA is still epic.

Arma II should be the kind of game in which the HD 6990 4GB shines, as it's a notorious resource hog. To its credit, the card was one of only two cards that could play the game at 2,560 x 1,600 with 4x AA and our punishing Very High settings. Unfortunately for AMD, it was the slower of the two cards by 6fps, and its minimum of 26fps was precariously close to being unplayable. Flicking the Antilles Switch didn't help either – the minimum frame rate didn't budge. It was interesting to see that the HD 6990 4GB managed higher average frame rates in Arma II than the GTX 590 3GB, which is possibly an indication that the driver isn't getting the most performance from the hardware.

Bad Company 2 again let the HD 6990 4GB stretch its legs and attempt to justify its humongous price tag, which it did to a degree. It was one of only two cards that managed a comfortably playable minimum frame rate, with the GeForce GTX 580 1.5GB a little too close to the 25fps cut-off point for comfort. In its overclocked mode, the HD 6990 4GB was the fastest card on test. The card stuttered at 1,680 x 1,050, which made the game unplayable. AMD says that it focuses its efforts on the higher resolutions with cards such as this, but we didn't see any such issues from the dual-GPU GTX 590 3GB, so we still have to place a question mark over the driver support of the HD 6990 4GB.

As you'd expect, given that it's an AMD card, folding performance was below par. The card only produced 8,330ppd at its stock speed and 8,408 at in its overclocked mode. It caused our test rig to consume 411-454W (depending on whether or not it was overclocked) while producing this meagre output, so you'd have to be mad to use it for this purpose.

As you'd expect, it isn't easy to keep the heat from two large, fast GPUs under control, even if you use fancy TIM and a pair of vapour chambers. It didn't shock us to see a delta T of 60c at stock speeds and of 63c when overclocked. When under load, the HD 6990 4GB was the also the loudest of the cards we reviewed, although it managed to be just shy of hairdryer levels of noise.

There is no doubting the gaming performance of the HD 6990 4GB; it barely blinked at running most games at 2,560 x 1,600 – but this comes at a price. The HD 6990 4GB is loud and uses an obnoxious amount of power, throwing away the PCI Express rulebook in the process. While the HD 6990 4GB is $100 cheaper than the GeForce GTX 590 3GB, the GeForce card is faster and we saw none of the slight driver issues that the HD 6990 4GB displayed in some tests.

+ Very fast.

− Slower than the GTX 590; loud; runs hot; consumes more power than New Zealand; driver issues.

BEST RESOLUTION
2560 x 1600

WHEN UNDER LOAD, THE HD 6990 4GB WAS THE LOUDEST CARD WE RAN – ALTHOUGH IT MANAGED TO BE JUST SHY OF HAIRDRYER LEVELS OF NOISE.

Nvidia GeForce GTX 550 Ti 1GB

Fine for gaming on a 22in screen, this is the best card for around $200.

Street Price $175
Manufacturer www.nvidia.com

Retailing at $175, the GeForce GTX 550 Ti 1GB sits at the bottom of Nvidia's current generation of GPUs and is aimed at the more budget-conscious gamer. The GPU is an evolution of the disappointing GeForce GTS 450 1GB, with a significantly improved back-end adding an extra eight ROPs (to bring the total to 24) and a wider 192-bit memory interface.

The GF116 processor runs at 900MHz (up from 783MHz) and the 192 stream processors zip along at 1,800MHz (up from 1,566MHz). All this adds up to giving the GTX 550 Ti 1GB a memory bandwidth of 98.5GB/sec – nearly double that of the GTX 450 1GB – to help it cope better with post-processing effects such as AA.

The extra clock speed and resources have made the GTX 550 Ti 1GB a far more competent card than the GTS 450 1GB. In Dirt 2 it was capable of maintaining playable frame rates at every test resolution, even outperforming the $350 Radeon HD 6950 2GB at 1,680 x 1,050 and 1,920 x 1,080. The GTX 550 Ti 1GB was 29fps quicker than the Radeon HD 5770 1GB at these two resolutions.

Playing Black Ops was also well within reach of the GTX 550 Ti 1GB. Its minimum frame rate of 42fps at 2,560 x 1,600 provided a smooth experience. Its performance at 1,920 x 1,080 was a particular highlight, as its 71fps minimum frame rate was quicker than that achieved by the GeForce GTX 460 1GB and the HD 5770 1GB.

Unfortunately, the 192 stream processors of the GTX 550 Ti 1GB struggled a bit with our PC-exclusive games, even with all their back-end enhancements. The choppy 23fps minimum we saw in Arma II at 1,680 x 1,050 made the game difficult to play, but the card could run Bad Company 2 at 1,680 x 1,050. The HD 5770 1GB was a significant 2fps slower in Arma II at 1,680 x 1,050 and 6fps slower in Bad Company 2 at the same resolution.

At least the GTX 550 Ti 1GB is frugal when it comes to power consumption. It caused our test PC to draw 243W when gaming, which was one of the lowest results that we saw. While 7,235ppd for a system power draw of 213W is fine, the GTX 460 768MB now costs more and produces 8,903ppd for a system power draw of 215W. At least the basic cooler of the Zotac we tested remained quiet throughout our testing – we see little reason for hairdryer coolers for this card.

The 550 Ti 1GB offers solid performance given its price – it could play all but the most-demanding of our test games at 1,680 x 1,050 with 4x AA; lose the AA from Arma II and you'll be able to play that game on a 22in screen too. While the card is likely to age badly for PC exclusive titles, it coped brilliantly with console ports. It's not much of an upgrade from a HD 5700 or something of equivalent performance, but if your PC just can't run current games or you're building a cheap gaming PC from scratch, this is the best card for the money.
PAUL GOODHEAD

+ Cheap; reasonable blend of price and performance.

– Likely to age quickly.

BEST RESOLUTION
1680 x 1050

Nvidia GeForce GTX 560 Ti 1GB

The best card for under $300 just about keeps its Radeon rival at bay.

Street Price $270
Manufacturer www.nvidia.com

We loved the Nvidia GeForce GTX 560 Ti 1GB when we first saw it as it offered great performance for a not unreasonable price. Annoyingly for Nvidia, the card was launched onto the market just as the Sandy Bridge chipset fiasco came to light, meaning that despite excellent performance, sales failed to live up to expectations as people held off buying new PCs. Thankfully, everything is getting back on track now – so is it still worth your money?

The ticking heart of the GTX 560 Ti 1GB is the GF114 GPU, which is built around 384 stream processors. This may sound like a relatively puny amount compared with some of the AMD cards, but AMD and Nvidia have slightly different definitions of what constitutes a stream processor so the numbers aren't directly comparable.

As with all the other Nvidia GPUs on test, the stream processors run at double the speed of the rest of the GPU, in this case that means a frequency of 1,640MHz. Working alongside the stream processors is a bank of 64 texture units and 32 ROPs; this is actually four more texture units than the vastly more expensive GeForce GTX 570 1.3GB. The 1GB of memory runs at 1GHz (4GHz effective) through a 256-bit interface, giving a total memory bandwidth of 128GB/sec.

The GTX 560 Ti 1GB demolished Black Ops and Dirt 2, producing minimums of 58fps and 55fps respectively at 2,560 x 1,600 with 4x AA. This was 8fps faster than the $350 Radeon HD 6950 1GB in Dirt 2 but 13fps slower in Black Ops.

Arma II is a noticeably tougher game to run, but the GTX 560 Ti 1GB still managed a playable 30fps minimum and 35fps average at 1,920 x 1,080 with 4x AA. This is only 2fps behind the $15 more expensive HD 6950 1GB and the last-generation flagship GeForce GTX 480 1.5GB. Playing the game at 2,560 x 1,600 was beyond any of these three cards, however.

Our results in Bad Company 2 made interesting reading, with the GTX 560 Ti 1GB becoming progressively faster than the HD 6950 1GB as we increased the resolution. The minimum frame rate of 32fps at 1,920 x 1,080 was 3fps quicker than its AMD rival, and neither card was capable of playing the game at 2,560 x 1,600 with 4x AA.

As expected, the GTX 560 Ti 1GB was very productive when it came to folding. Its 13,193ppd was the fifth highest result we saw, and was only bettered by Nvidia's most expensive cards, all of which cost much more. The 560 Ti 1GB did consume a fair amount of power during our testing; it caused our PC to draw 302W when gaming and 243W when folding. The HD 6950 1GB was better behaved, causing the test system to draw 254W when gaming. The custom-cooled Zotac card we used for testing was at least quiet.

With performance that's roughly equivalent to that of a $350 HD 6950 1GB (with some games a bit faster and some a bit slower), it's the price of the GTX 560 Ti 1GB that makes it the better card. A saving is always welcome, even if the GTX 560 Ti 1GB consumes more power than the competing Radeon.

PAUL GOODHEAD

+ Excellent at 1,920 x 1,080; generally as fast as the Radeon HD 6950 1GB.

− High power consumption; no price cut yet.

BEST RESOLUTION
1920 x 1080

Nvidia GeForce GTX 570 1.3GB

Quick, and the reference cooler is excellent.

Street Price $380
Manufacturer www.nvidia.com

The GeForce GTX 570 1.3GB is part of Nvidia's second generation of Fermi architecture cards which, fortunately, run much cooler than the original Fermi GPUs. Part of the reason for this improvement is Nvidia's use of conventional fast-switching but leaky transistors for performance-critical areas, and slower, less leaky transistors for the other parts.

The GPU contains 480 stream processors – 96 more than the GeForce GTX 560 Ti 1GB but 32 less than the GeForce GTX 580 1.5GB – which run at a 1,464MHz. This is twice the speed of the rest of the GPU core, which runs at 732MHz. Also bundled in the GPU are 15 tessellation units and 60 texture units, which is only one less tessellation unit and four fewer texture units than the much more expensive GTX 580 1.5GB.

The GTX 570 1.3GB had no problem dealing with Dirt 2 or Black Ops, as these games were developed with five-year-old consoles in mind. The headline news therefore isn't that the card could play both games at 2,560 x 1,600 with 4x AA, but that it's performance matched or bettered that of Nvidia's previous flagship card, the GeForce GTX 480 1.5GB, which is still available to buy for around $450. The GTX 570 1.3GB was 9fps slower than the Radeon HD 6970 2GB in Dirt 2, but 10fps faster in Black Ops – which is fine considering that the Radeon is $40 more expensive.

Performance in Bad Company 2 was solid, with a minimum of 42fps at 1,920 x 1,080 with 4x AA – the HD 6970 2GB was 4fps slower with a minimum of 38fps. While the GTX 560 Ti 1GB could also run Bad Company 2 smoothly at the same settings, its minimum of 32fps means that the GTX 570 1.3GB offers 31 per cent more performance for the extra money.

Arma II proved to be an interesting challenge for the GTX 570 1.3GB. At 1,680 x 1,050, the card was the third quickest on test but only managed a mid-table minimum of 33fps at 1,920 x 1,080. The HD 6970 2GB managed the same minimum but a slightly higher average of 42fps at 1,920 x 1,080.

The GTX 570 1.3GB proved to be an efficient folder, as it cranked out a massive 14,756ppd while causing our test rig to draw a reasonable 284W from the wall. The excellent reference cooler was easy to live with as well as being effective – the peak delta T of 54c when gaming wasn't particularly high despite the power of the GPU.

The GTX 570 1.3GB traded blows with the HD 6970 2GB throughout our games testing, making both fine cards to receive for a birthday. However, this card has an excellent cooler, is a brilliant folder and costs $40 less, it would be the card that we'd buy if we had around $400 to spend. You can argue that the much cheaper GTX 560 Ti 1GB can run all our games smoothly at the same settings as the GTX 570 1.3GB for $110 less, but it's worth spending extra on a new graphics card where possible, as the extra speed will stand up to new games for longer.

PAUL GOODHEAD

+ Excellent folding performance; great cooler; solid gaming performance.

− You could opt for a GTX 560 Ti 1GB.

BEST RESOLUTION
1920 x 1080

Nvidia GeForce GTX 580 1.5GB

Caught in a limbo, it's too expensive for the speed on offer.

Street Price $550
Manufacturer www.nvidia.com

After the disappointingly toasty GeForce GTX 480 1.5GB, Nvidia's Fermi-based successor, the GeForce GTX 580 1.5TB, has proven itself better in nearly every way. Its GPU core runs 72MHz higher than the GPU it replaces at 772MHz, and it has 32 more stream processors that run at 1,544MHz. The GTX 580 1.5GB uses less power-hungry transistors in non-performance-critical areas of the GPU to keep down its power consumption, which means that it creates less waste heat than the phenomenally hot and loud GTX 480 1.5GB.

At $550, the GTX 580 1.5GB is the most expensive single-GPU card on test, which means that it has a price bracket all to itself. It's $170 more expensive than the GTX 570 1.3GB but $250 cheaper than the HD 6990 4GB, which is the next card up in the price scale.

The GTX 580 1.5GB breezed through our game tests at 1,920 x 1,080 – Arma II was the most demanding test, although the minimum frame rate was still a silky-smooth 38fps. This was only bettered by the two new (and extremely expensive) dual-GPU cards, and even then we had to use the warranty-voiding Antilles Unlocking Switch to achieve a superior frame rate from the Radeon HD 6990 4GB. Bad Company 2 was great fun on the GTX 580 1.5GB, with the frame rate never dipping below 42fps, while Black Ops and Dirt 2 also proved no problem for the GTX 580 1.5GB, with minimum frame rates of around 100fps.

At 2,560 x 1,600, the GTX 580 1.5GB was still able to play every game on test smoothly, apart from Arma II. The frame rate in Dirt 2 and Black Ops never dipped below 70fps, for example. However, Bad Company 2 was dangerously close to being what we consider to be unplayable, with the GTX 580 1.5GB only managing a minimum frame rate of 26fps. If you want to play Bad Company 2 without a hitch on a 30in screen, you'll need to consider the GeForce GTX 590 3GB or the HD 6990 4GB.

Our test system drew a hefty 305W while folding, but at least the GTX 580 1.5TB recorded a huge score of 16,492ppd. This was second only to the GTX 590 3GB, which managed 25,780ppd thanks to its second GPU. While the GTX 580 1.4GB was the most power-hungry single-GPU graphics card and one of the hottest too, this was only by a tiny margin. It remained fairly quiet throughout testing – far more so than the tornado-like GTX 480 1.5GB.

The GTX 580 1.5GB finds itself in an awkward situation, and not just because it has no direct competitor on price. The much cheaper GTX 570 1.3GB is more than capable at gaming at 1,920 x 1,080, yet the GTX 580 1.5TB struggled to run all our games smoothly at 2,560 x 1,080. It failed to do so with Arma II and only just managed a playable minimum of 26fps in Bad Company 2. While the extra performance over a GTX 570 1.3GB at 1,920 x 1,080 is welcome, it isn't enough to justify the price difference. The only reason to buy this card is if you're extremely sceptical about multi-GPU setups, as the single-GPU construction is less dependent on driver updates to deliver a decent amount of performance.

ANTONY LEATHER

+ Very fast at 1,920 x 1080; excellent for folding; fairly quiet; single-GPU design.

− Power-hungry; can't handle all games at 2,560 x 1,600.

BEST RESOLUTION
1920 x 1080

Nvidia GeForce GTX 590 3GB

Amazing performance – Nvidia needs to maintain this with its driver support.

Street Price $900
Manufacturer www.nvidia.com

It's been more than two years since we've seen a new multi-GPU GeForce graphics card, and since then Nvidia's fortunes have dipped and risen like the metaphorical rollercoaster. The first generation of Fermi GPUs, based on the GF100 architecture, proved much too hot, power-hungry and noisy even on single-GPU cards. However, with the use of low-leakage transistors for non-performance critical components, the revised GPUs of the GTX 500-series have made a dual-GPU card possible.

Unlike the GTX 295 1,792MB, which used two semi-skimmed GT200b GPUs, Nvidia has chosen to equip the GTX 590 3GB with two full-fat GF110 GPUs; this is the same GPU as used in GeForce GTX 580 1.5GB cards. However, the frequencies have been lowered to a GPU core of 607MHz compared to the 772MHz of the GTX 580 1.5GB. This is a 21 per cent drop, although the obvious advantage of having two GPUs running in tandem makes the GTX 590 3GB look considerably faster on paper.

The decision to use such conservative clock speeds might seem odd, but it has allowed Nvidia to use a cooler similar to that of the Radeon HD 6990 4GB and Nvidia's single-PCB version of the GTX 295 1,792MB. The two GPUs are arranged at either end of the card, with the power delivery circuitry in the middle. Each GPU is topped by its own vapour chamber heatsink assembly, with a single radial fan in the centre of the card blowing air over both heatsinks. This means that half of the card's heat is exhausted directly into your case.

With board space at a premium, the card's 3GB of GDDR5 memory has been split between both sides of the PCB, with six 128MB modules arranged around each GPU, making a total of 24 modules and a total memory capacity of 3,072MB. Since the GTX 590 3GB is equipped with two full-sized GF110 GPUs, it boasts a whopping count of 1,024 stream processors. This also means the GTX 590 3GB boasts eight rasterisers, (four per GPU) and 32 tessellation units (16 per GPU). It also sports 120 texture units (60 each) and 96 ROPs (48 each).

Performance

In Dirt 2, the GTX 590 3GB topped all three performance charts, and by a considerable margin at the crucial super-high resolution of 2,560 x 1,600. Even after flicking on the Antilles Unlocking Switch (and voiding our warranty), the Radeon HD 6990 4GB couldn't compete; it delivered a minimum frame rate of 96fps compared to the 113fps of the GTX 590 3GB.

At the most pertinent resolution for cards costing over up towards a grand, the GTX 590 3GB was also triumphant in Black Ops, if only by 2fps over the HD 6990 4GB in warranty-void mode. The minimum frame rate of 84fps was mighty, and the average of 136fps is frankly ludicrous. Again, we saw the performance bug at 1,920 x 1,080 though – all the dual-GPU cards struggled with the full-HD resolution, with their minimum frame rates refusing to go beyond 84fps.

Arma II is possibly the most interesting of our four test games for this card, as it's a system killer. The GTX 590 3GB launched a campaign of shock and awe on our test rig, pulling out playable frame rates even at the crippling resolution of 2,560 x 1,600. Considering that we insist on playing the game with its Very High detail settings and 4x AA, the card's minimum frame rate of 31fps was incredible.

Even the overclocked HD 6990 4GB struggled at the same settings, managing a minimum frame rate of 26fps. At 1,920 x 1,080 with 4x AA, we saw an incredible minimum of 52fps from the GeForce card; a massive 14fps lead over the HD 6990 4GB at stock speeds, and an 11fps lead when the AMD card was in RMA-nightmare mode. Interestingly, the GTX 590 3GB typically achieved lower average frame rates than the HD 6990 4GB. We can't say for sure whether this means that the graphics driver of the GTX 590 3GB is written to deliver consistent performance, or just that Nvidia's GPU architecture copes better with the demands of Arma II's taxing graphics engine.

Only Bad Company 2 found a gap in the GTX 590 3GB's armour, with the warranty-flouting HD 6990 4GB beating its minimum frame rate by 1fps and the average by 7fps. At least the GTX 590 3GB didn't suffer from any of the stuttering problems that we saw in this game with the other dual-GPU card, which is a gold star for Nvidia's driver team.

It was no surprise to find that the two GPUs of the GTX 590 3GB ran rather hot, despite the pair of vapour chambers and a high-airflow fan. We saw an idle temperature of 21c and a peak temperature of 59c. As expected from a graphics card that breaks the PCI Express 2.0 power draw spec, our test system happily chugged through plenty of power when gaming – up to 491W, in fact. In contrast, the HD 6990 4GB caused our system to consume 417W of power at stock speeds and up to 463W when overclocked.

The GTX 590 3GB proved imperious when it came to folding performance, clocking in a titanic 25,780ppd. This stressed the card a lot, though, and Nvidia's stock cooler is hardly quiet when working hard – it may be quieter than the cooler of the HD 6990 4GB, but it was still clearly audible over the air-conditioning in our lab.

Annoyingly, as the fan is placed between the two heatsink elements of the cooler, it blows hot air out of both ends, like the HD 6990 4GB cooler. However, as the internal end of this cooler is completely open, we could feel more airflow entering our test case than there was being exhausted. This means that a lot of heat is dumped inside your case, typically around the hard disk bays.

A card such as this is almost solely judged on its performance – whether it bashes every game known to man into submission with its brutal graphics power, or cringes at the likes of Arma II. The GTX 590 3GB is definitely of the former persuasion, topping our performance charts in almost every test, no matter which resolution we used or which game we played. As we saw no sign of poorly optimised driver support, we have to recommend it – it's the fastest card in the world and costs only $100 more than AMD's alternative. However, it's up to Nvidia to maintain this excellent level of support and optimisation during the life of this card.

PAUL GOODHEAD

+ The quickest graphics card; excellent driver support at the moment.

− Dumps a lot of waste heat in your case; loud under load; will Nvidia keep the driver up to date?

BEST RESOLUTION
2560 x 1600

LAUNCHING A CAMPAIGN OF SHOCK AND AWE ON OUR TEST RIG, THE GTX 590 3GB PRODUCED PLAYABLE FRAME RATES IN ARMA II.

MIONIX

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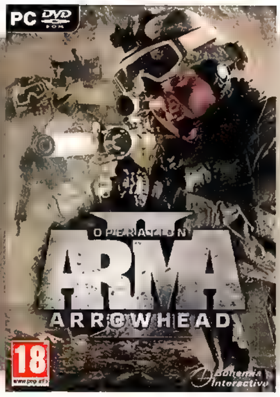
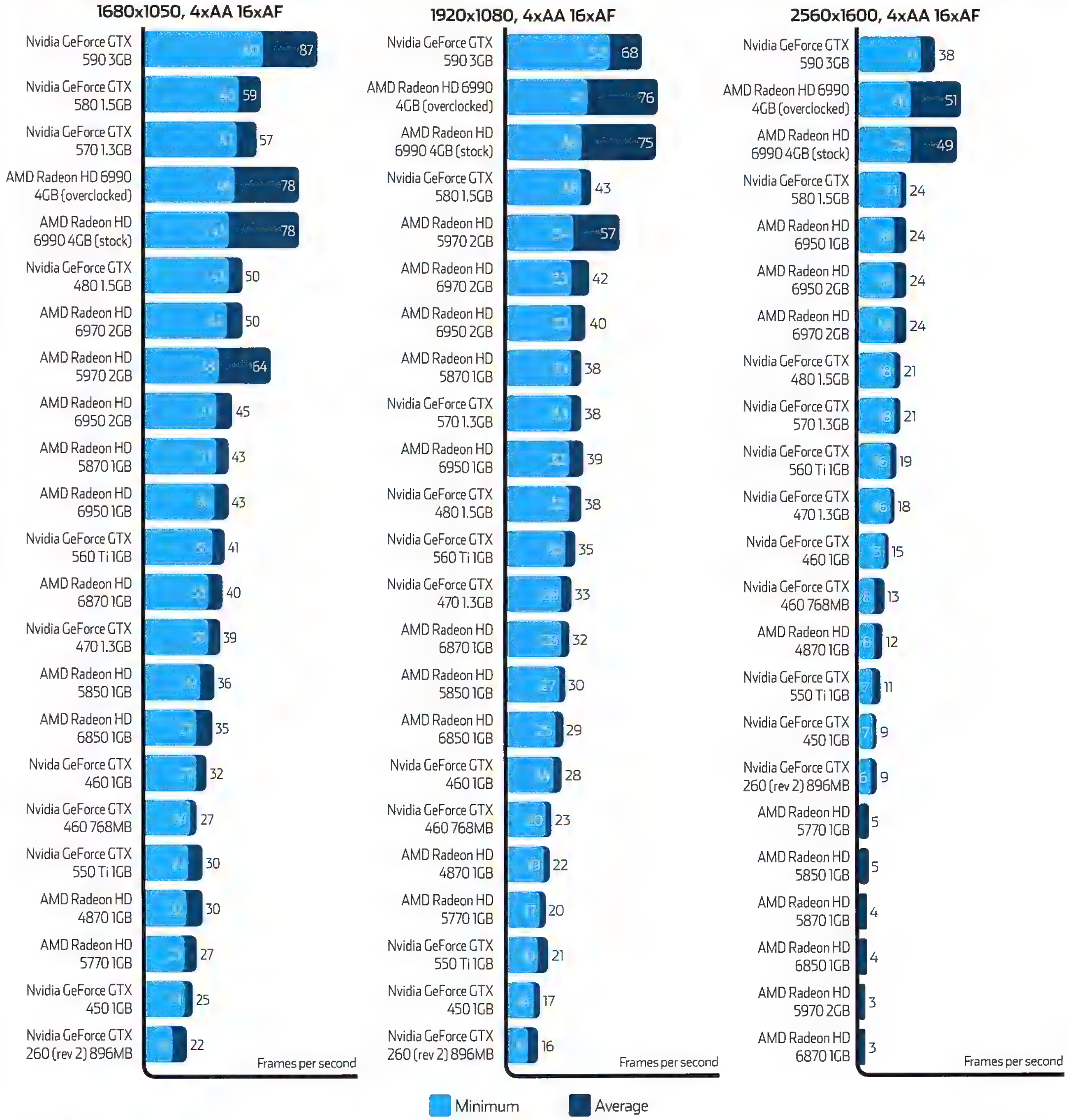


ARMA II: OPERATION ARROWHEAD

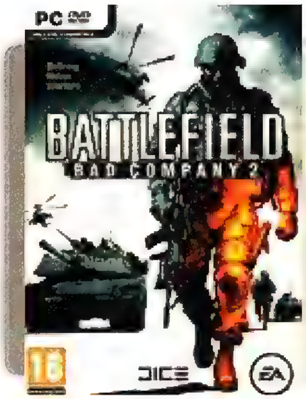
Arma II is the quintessential military sim, with super-realistic gameplay and ordinance. Unfortunately this also means that you need a killer PC to run the game at its best - this not only means a high-end graphics card, but also a fast, multi-core CPU. You can read our review of Arma II: Operation Arrowhead in Issue 84, p102.

Note: The AMD Radeon HD 6990 4GB was tested at its default speed (stock) and with the Antilles Switch enabled (overclocked).


1680x1050, 4xAA 16xAF

1920x1080, 4xAA 16xAF

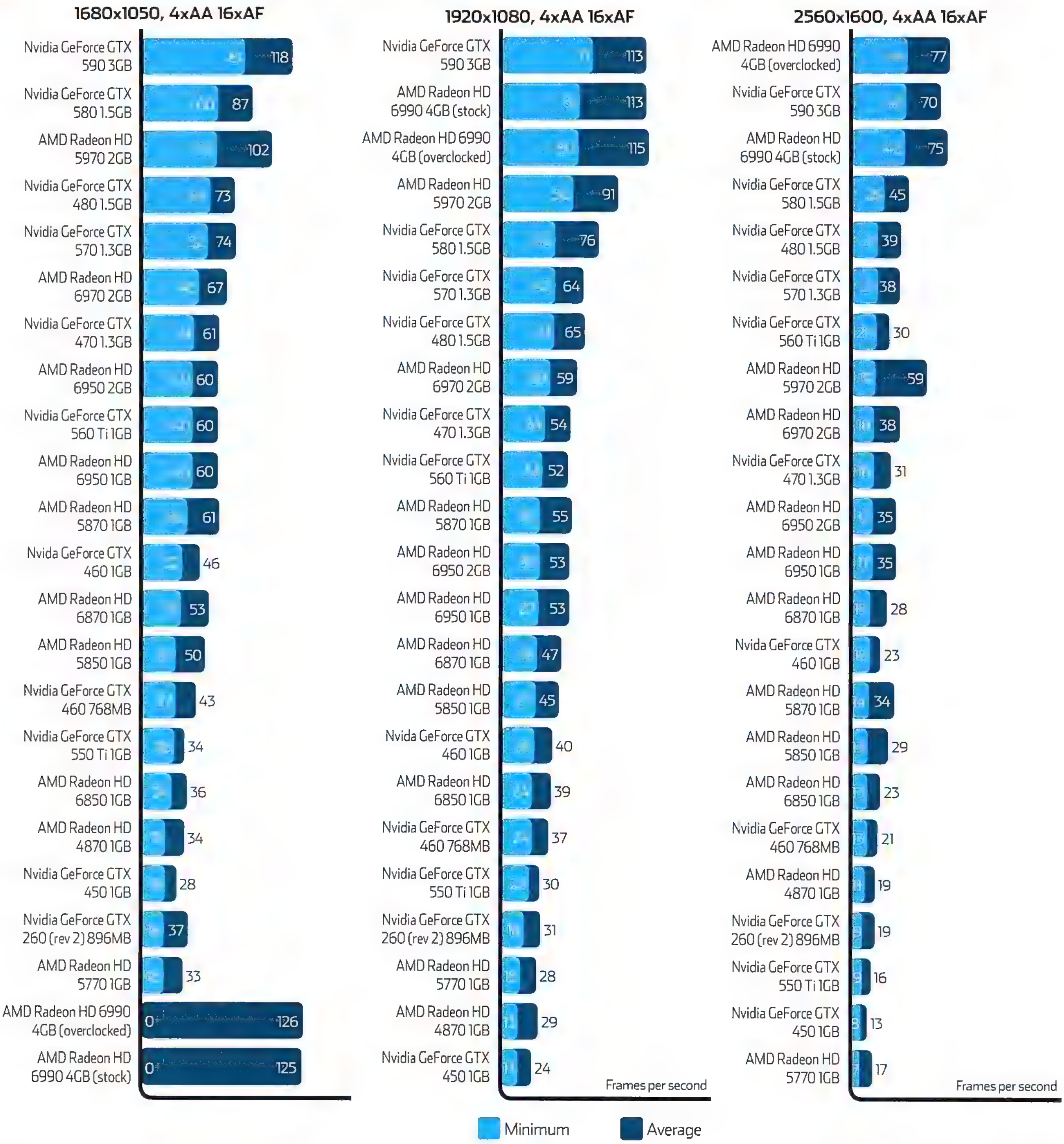
2560x1600, 4xAA 16xAF



BATTLEFIELD: BAD COMPANY 2

Bad Company 2 is one of our favourite games of the past year or so, and still great fun to play either in single player or online. The demanding Frostbite 2.0 graphics engine also gives graphics cards a thorough workout. You can read our Bad Company 2 review in Issue 81, p90.

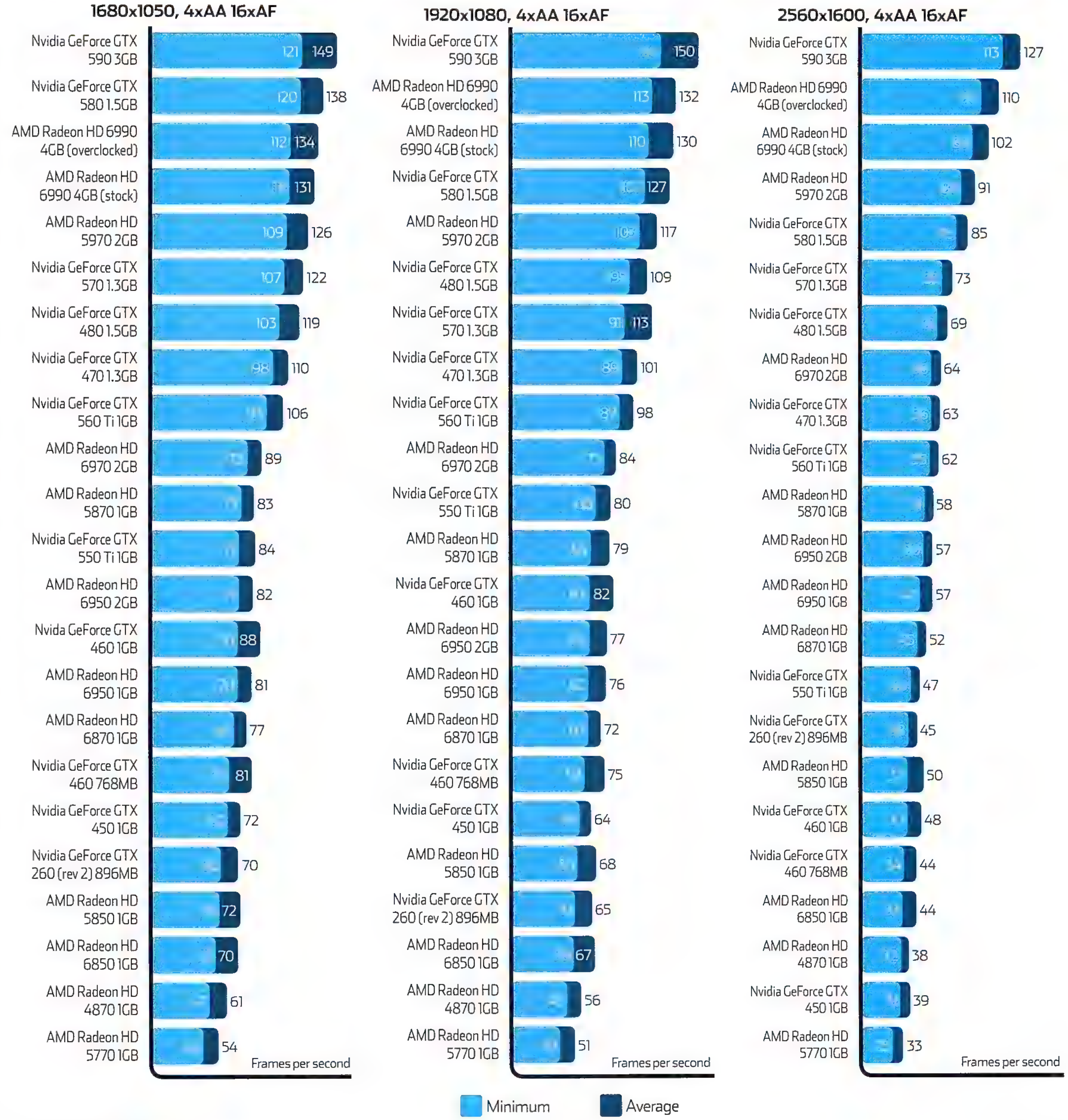
Note: The AMD Radeon HD 6990 4GB was tested at its default speed (stock) and with the Antilles Switch enabled (overclocked).



COLIN MCRAE: DIRT 2

Dirt 2 is one of the best racing games currently available, with an active online community and a challenging variation of race types and vehicles. A card that performs well in this game should also cope well with the forthcoming (and imaginatively titled) sequel, Dirt 3. We didn't review Dirt 2 when it came out – David is doing a 24-hour endurance race as penance (and weeping the entire time).

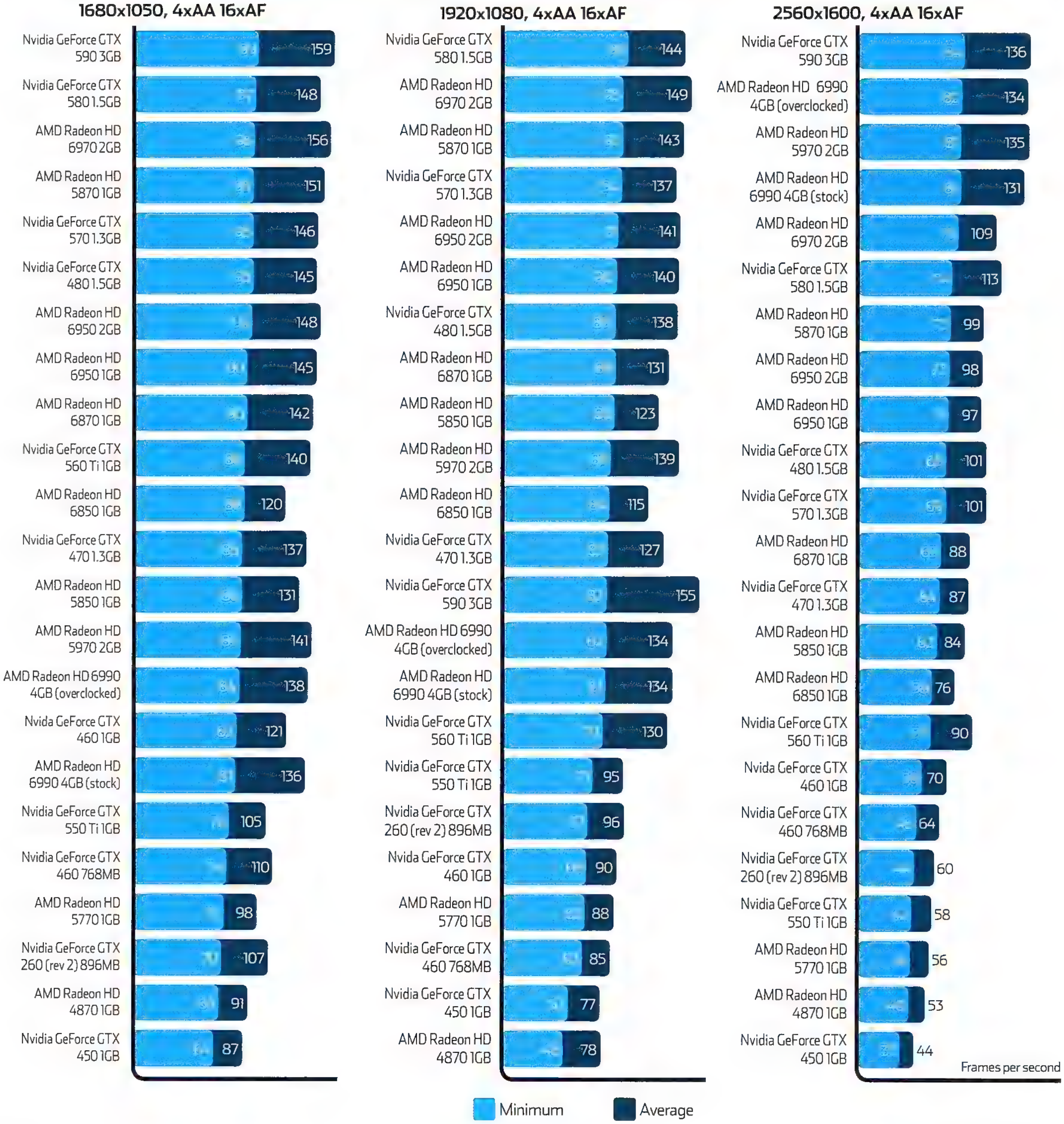
Note: The AMD Radeon HD 6990 4GB was tested at its default speed (stock) and with the Antilles Switch enabled (overclocked).



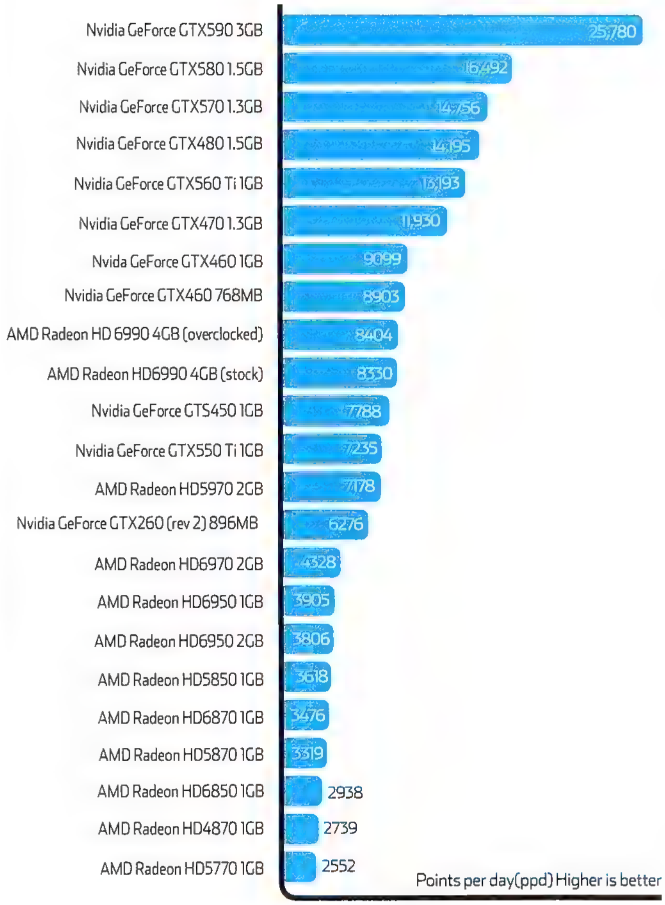
CALL OF DUTY: BLACK OPS

Black Ops is one of the most highly played games of the day, breaking sales records since it was launched a few months ago. As we want our testing to represent what people actually use their PCs for, it's an obvious game to test with. You can read our full review of Black Ops in Issue 89, p86.

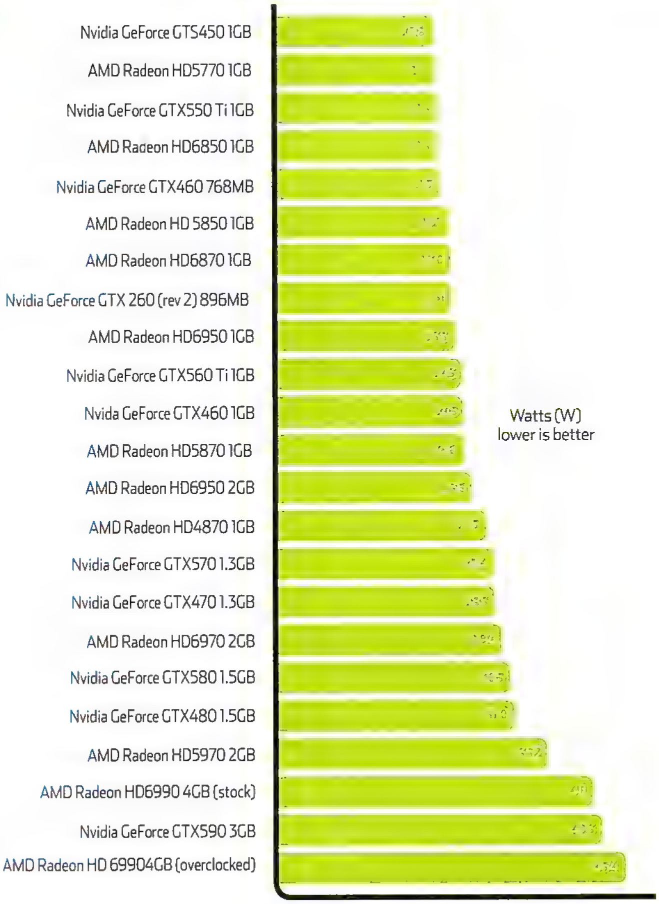
Note: The AMD Radeon HD 6990 4GB was tested at its default speed (stock) and with the Antilles Switch enabled (overclocked).



Folding PPD

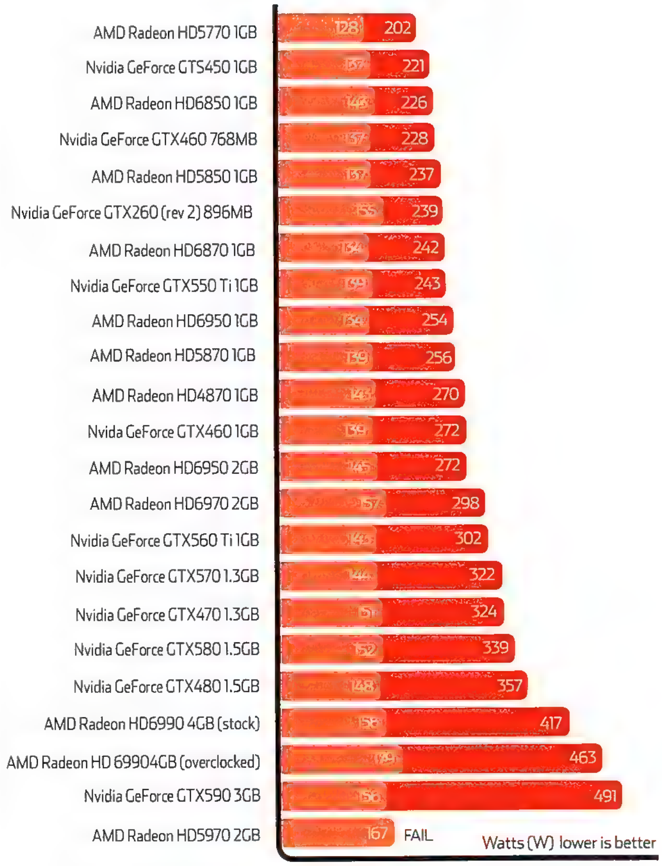


Folding Power



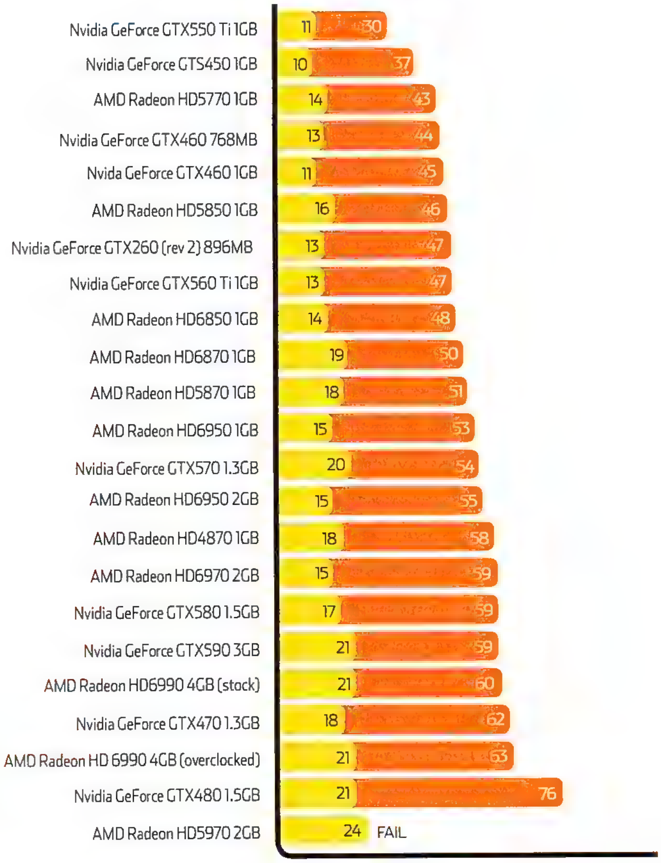
Gaming Power

Total system power consumption



GPU Delta T

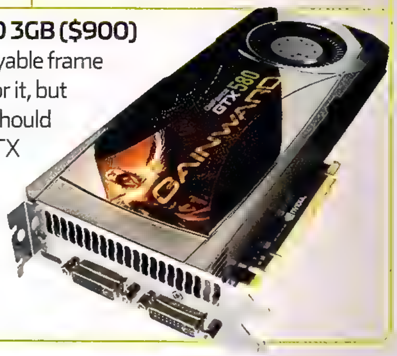
Total system power consumption



What to buy

With over 700 tests, and 22 GPUs tested and 10 reviewed, it could be tricky to find which is the best for you. We come to the rescue, breaking down your choices by budget and screen size.

Upgrade

Your card is / You game at	Two to three years old such as a GeForce GTX 260 (rev 2) 896MB or Radeon HD 4870 1GB	Mid-range, one to two years old such as a Radeon HD 5850 1GB or GeForce GTX 460 1GB	High-end, one to two years old such as a Radeon HD 5870 1GB or GeForce GTX 480 1.5GB
1680x1050	**Nvidia GeForce GTX 560 Ti 1GB ($270)** To see a decent performance boost across the board, the GTX 560 Ti 1GB is the card to buy. Anything cheaper won't be much faster than your current card. 	**You don't need to upgrade** Graphics cards such as the Radeon HD 5850 1GB and Radeon HD 5870 1GB achieved playable frame rates at this resolution in all our games. Fine tuning game settings and overclocking your card should provide a big enough boost if things are getting edgy.	
1920x1080	**Nvidia GeForce GTX 560 Ti 1GB ($270) or Nvidia GeForce GTX 570 1.3GB ($380)** The GTX 560 Ti 1GB held its own at this resolution too, providing playable frame rates in all games. The GTX 570 is $90 more but is even faster, meaning that it will cope with everything you throw at it over the next year or two. 		**You don't need to upgrade** Our tests showed that cards such as the HD 5870 1GB were more than capable of playing all our games at this resolution.
2560x1600	**Nvidia GeForce GTX 580 1.5GB ($550) or Nvidia GeForce GTX 590 3GB ($900)** The GTX 580 1.5GB was the only single-GPU graphics card to achieve playable frame rates in three of our four games at this resolution. Arma II was too much for it, but dropping the AA, lowering the in-game settings or overclocking the card should fix this. For awesome performance at this resolution, you can't beat the GTX 590 3GB though. This card made mincemeat of our games and is a substantial upgrade from any other graphics card, excluding its closest rival, the Radeon HD 6990 4GB. It's power-hungry however, and while the cooler isn't infuriatingly loud, it does dump a lot of heat into your case. We' recommend water-cooling the card to keep it in check. 		

Building from Scratch

Your budget is You game at	Around 100	Around 300	Around 500	Around 600
1680x1050	**Nvidia GeForce GTX 550 Ti 1GB ($175)** The GTX 550 Ti managed playable frame rates in all our tests except Arma II at this resolution. Dropping the AA should solve this.	**Nvidia GeForce GTX 560 Ti 1GB ($270)** The GTX 560 Ti 1GB was very fast in all our games at this resolution, and has enough power to keep games smooth if you buy a larger monitor in the near future.	**Not worth spending over $300 at this resolution**	**Not worth spending over $300 at this resolution**
1920x1080	**You'll need to spend more, unfortunately**	**Nvidia GeForce GTX 560 Ti 1GB ($270)** The GTX 560 Ti 1GB managed playable frame rates in all four of our test games at this resolution – not bad for a card that costs under $300.	**Nvidia GeForce GTX 570 1.3GB ($380)** The GTX 570 1.3TB gives you plenty of performance to cope with the demands of future games, as well as your current favourites.	**Nvidia GeForce GTX 580 1.5GB ($550)** The GTX 580 1.5GB is the fastest single-GPU card available, but it's only worth considering if you're not planning to get a higher resolution screen in the near future.
2560x1600	**Even eBay can't help you**	**Even eBay can't help you**	**You'll still need to spend more**	**Nvidia GeForce GTX 590 3GB($900)** With no sign of micro-stuttering and incredible performance, the GTX 590 3GB is epic. We just hope Nvidia can maintain the excellent driver support.

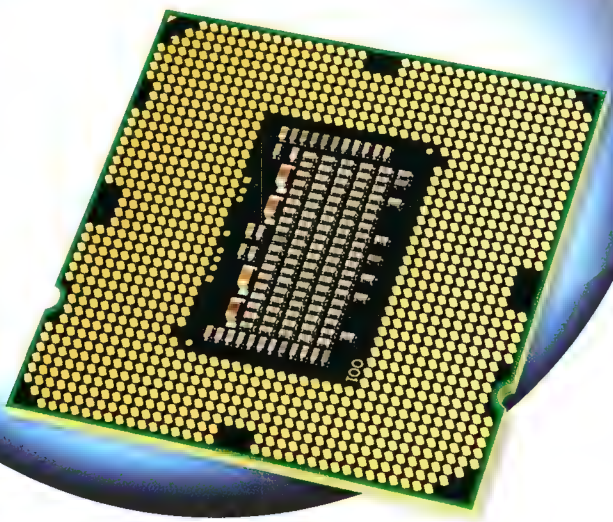
KITLOG

These are four of our basic systems, with something for every taste. **The Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. Our build has just gotten a little more expensive, but for that few hundred you're also getting cutting edge performance and one of the most overclockable chips you can get today.

It's great, it's broken, it's back...

Man, Sandy Bridge has been a hell of an awkward release, but by now boards should be coming back into retail and we can start getting on with all these planned builds that stalled back in January.

It really is the sweetspot in terms of price and performance, and we like sweet...

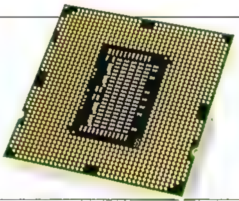


The Perfect PC, on the other hand, is the system everyone aspires to, with nothing but the best parts – without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – **www.atomicmpc.com.au/?NUMBER** – and you'll go straight to that review.

THE GAME BOX

CPU



Intel Core i5 2500-K

PRICE $290

Sandy Bridge's combination of cost and overlocking prowess is awesome.

Issue 122, Page 36

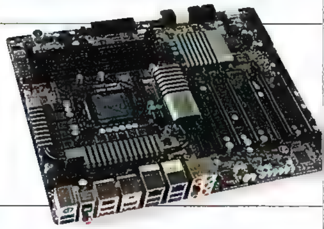
MOTHERBOARD

GIGABYTE P67A-UD7

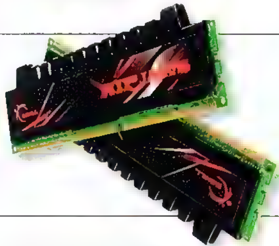
PRICE $365

A great P67 board with some nice features.

Issue 122, Page 46



MEMORY



G.Skill Ripjaws F3-10666CL7D-4GBRH

PRICE $130

Great value, tight timings, and some flexibility.

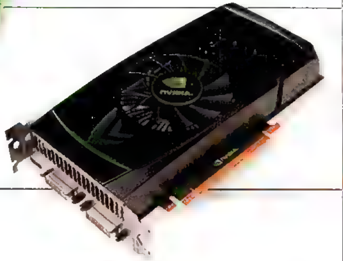
VIDEO CARD

NVIDIA GTX460

PRICE $245

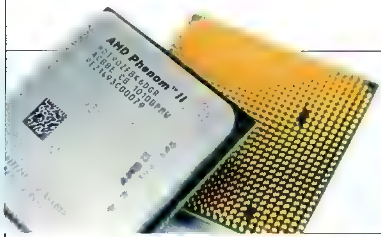
A reference-design card, but plenty fast for gaming bliss.

Issue 116, Page 38



THE PERFECT PC

CPU



AMD Phenom II X6 1090T

PRICE $355

Six cores of high-powered processing joy.

Red ID: 220395

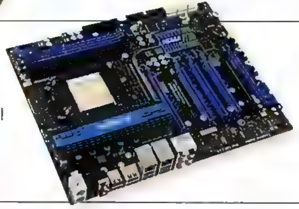
MOTHERBOARD

MSI 890FXA-GD70

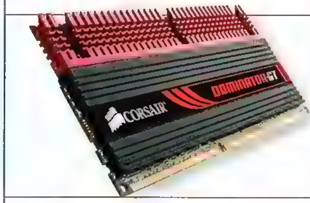
PRICE $265

A high-end AMD platform with full CrossFire support, great OC'er.

Ref ID: 221656



MEMORY



Corsair Dominator GT CMT4GX3M2A2000C8

PRICE $220

Red-hot memory for dual-channel speed.

VIDEO CARD

ATI 6990

PRICE $849

The new fastest video card on earth!

Issue 124, Page 36

For more builds check out the Kitlog E-mag at **atomicmpc.com.au/kitlog**

SUBTOTAL: $1890

COOLER

Coolermaster Hyper 212
PRICE $45

Nice cooling for a very affordable price.

SYSTEMDRIVE

1TB HDD
PRICE $90

A thousand gigabyte storage drive on the cheap.

DISPLAY

Viewsonic VX2233WM
PRICE $215

21.5 inches of value-packed screen, great buy.
Issue 108, Page 42

AUDIO

Plantronics Gamecom 777
PRICE $80

Solid set of cans with great audio.
Issue 101, Page 41

Onboard Realtek ALC889A
A decent chip that does the job.

CASE

Antec Lanboy Air
PRICE $220

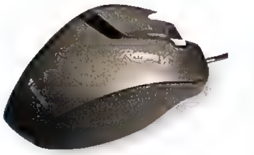
Unique looks and excellent cooling design.
Issue 120, Page 48

KEYBOARD

Razer Arctosa
PRICE $50

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

MOUSE



Verbatim Rapier V1
PRICE $65

Great gaming performance and nifty features.
Issue 96, Page 43

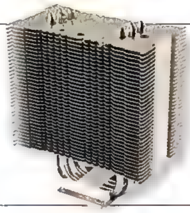
POWER SUPPLY

OCZ ModXStream Pro 600W
PRICE $105

Plenty of wattage, reliable, modular for neatness.
Issue 109, Page 59

SUBTOTAL: $5413

COOLER



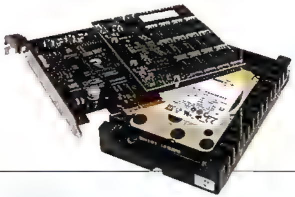
Noctua NH-U12P SE2
PRICE $95

Two fans, quiet and nice overclocking capacity.
Issue 107, Page 48

SYSTEMDRIVES

OCZ REvo Drive x2 & WD 600GB VelociRaptor
PRICE $780 + $400

Superfast SSD with zippy storage.
OCZ: Issue 121, Page 43
WD Ref ID: 220323



DISPLAY

Dell U2410
PRICE $699

In-Plane Switching, 1.07 billion colours and 24 inches.

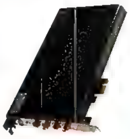
AUDIO

Logitech Z-5500D
PRICE $400

Earth-shakingly good.
Ref ID: 22626

Creative X-Fi Titanium HD
PRICE $270

Seriously serious sound.
Issue 115, Page 47



CASE

Silverstone Temjin Series TJ11
PRICE $600

Few can match the sheer space, cooling power, and sturdy construction.
Issue 124, Page46

KEYBOARD

Razer BlackWidow
PRICE $160

The new benchmark in gaming quality.
Issue 122, Page 50

MOUSE

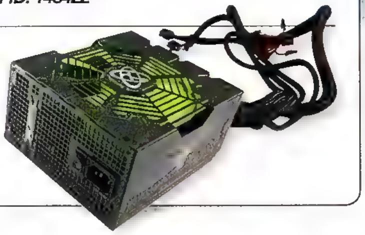
Microsoft Sidewinder X8 Wireless
PRICE $105

Cable-less, comfortable, lag-free and fraggable!
Ref ID: 148422

POWER SUPPLY

XFX 850W
PRICE $215

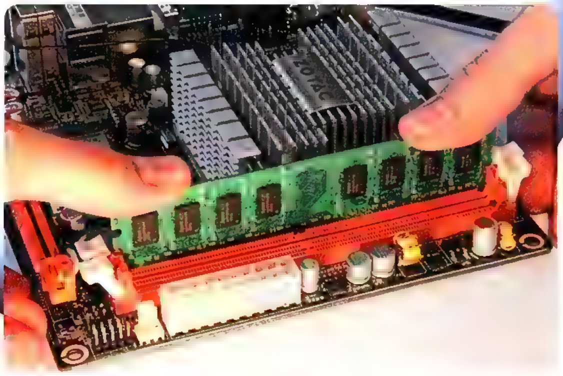
Plenty of power, ultra-stable rails and a great price.
Issue 107, Page 50



The **LAN Rig**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

There are many benefits to running an ITX system, aside from the challenge of choosing compatible components, but here are just a few of the plusses:

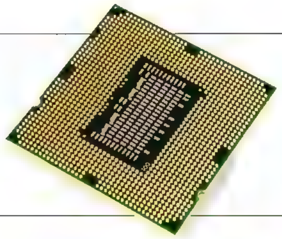
- Small footprint, so it'll fit damn near anywhere – even under a monitor.
- Lower power consumption due to restrained component choice.
- Generally low-noise due to the 'wind tunnel' design of most cases.
- Easily moveable around the house, or even taken to a mate's place – all you need is power and a screen.



Finally, for the more entertainment-minded – and really, that's all of us – there's **The Mini**, ready to play movies and music quietly and efficiently. The basic guts are fast enough for general tasks, and the IGP can handle High-Definition content. You can also choose from three entirely optional upgrades to suit your needs best: a graphics card for WoW, TV tuner to catch the game, or a Wireless card to sync without cables. The perfect energy-conscious build.

THE LAN RIG

CPU



Intel Core i5 760

PRICE $245

Intel's budget quad is more than you'll need in a chip!

Issue 106, Page 36

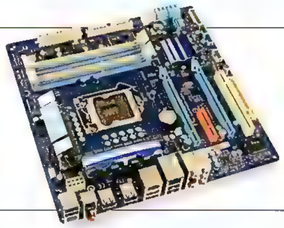
MOTHERBOARD

GIGABYTE P55M-UD4

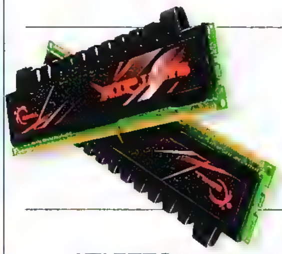
PRICE $200

Great overclockability, nice value.

Issue 107, Page 40



MEMORY



G.Skill Ripjaws 2000MHz

PRICE $190

Great value memory with amazing overclocking.

Issue 106, Page 52

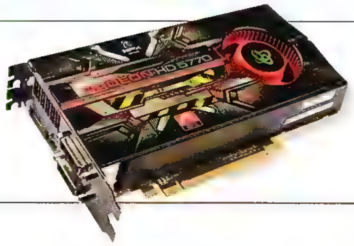
VIDEO CARD

ATI 5770

PRICE $190

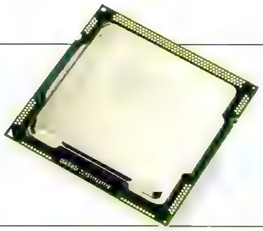
A decent value way to get into DX11.

Ref ID: 169775



THE MINI

CPU



Intel Core i3 530

PRICE $140

Speedy dual-core with an IGP for HD video duties.

MOTHERBOARD

GIGABYTE H55N-USB3

PRICE $145

Tiny ITX form factor with up to 4 storage devices. Neat.

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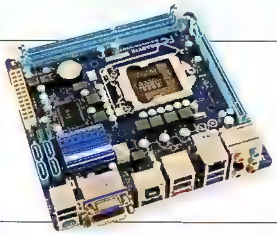


MEMORY

G.Skill Ripjaws F3-10666CL7D-4GBRH

PRICE $130

4GB of fast memory is plenty for running multiple HTPC media streaming apps.

VIDEO CARD

ATI 5570 Low Profile

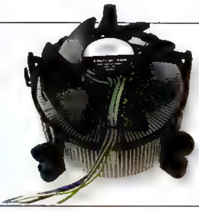
PRICE $100

Graphical grunt in half the space. Enough for basic games, given the size.

For more builds check out the Kitlog E-mag at **atomicmpc.com.au/kitlog**

SUBTOTAL: $1655

COOLER



Intel Stock Cooler
PRICE FREE

Does the job, fits under PSU well.

CASE

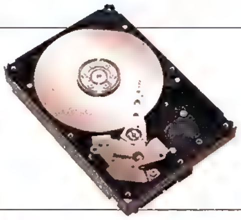
Silverstone SG04
PRICE $160

Small case with handle; add two 120mm fans for awesome cooling.
Ref ID: 148266

SYSTEM DRIVE

1TB HDD
PRICE $90

A thousand gigabyte storage drive on the cheap.



KEYBOARD

Razer Arctosa
PRICE $50

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

DISPLAY

Viewsonic VX2233WM
PRICE $215

21.5 inches of value-packed screen, great buy.
Issue 108, Page 42

MOUSE

Verbatim Rapier V1
PRICE $65

Great gaming performance and nifty features.
Issue 96, Page 43

AUDIO

Plantronics Gamecom 777
PRICE $80

Solid set of cans with great audio.
Issue 101, Page 41

Onboard Realtek ALC889A
A decent chip that does the job.

POWER SUPPLY

Corsair HX-520
PRICE $140

Modular, efficient and keeps size manageable in cramped case.

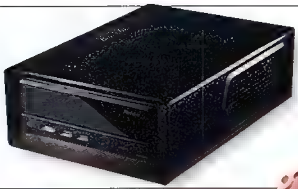
SUBTOTAL: $1033

COOLER

Scythe Big Shuriken
PRICE $55

Tiny 58mm height, quieter than a sponge.

CASE



Antec ISK 300-150
PRICE $110

Included 150W PSU, good build quality, and decent airflow.

SYSTEM DRIVE

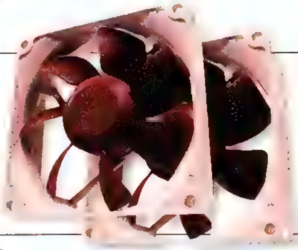
WD Scorpio Blue 640GB
PRICE $120

Fast 2.5" internal storage – grab two for more space!

COOLING

Noctua NF-R8
PRICE $22 x 2

Get some quiet, positive flow in this mini build.



OPTICAL

Lite-On DS-8A4S
PRICE $70

Slim internal DVD drive for movies, installs or backups.

KEYBOARD

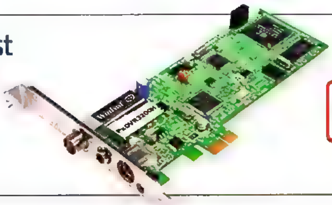
Logitech diNovo Edge
PRICE $199

Wireless board with a trackpad for mousing.

TV TUNER

Leadtek Winfast PxDVR3200 H
PRICE $100

Get TV in your PC. H.264 recording ftw!

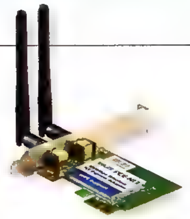


OR

WIRELESS

ASUS PCE-N13
PRICE $45

Zippy 802.11N for wireless HD video streaming.



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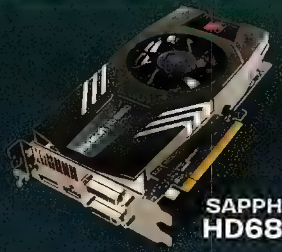
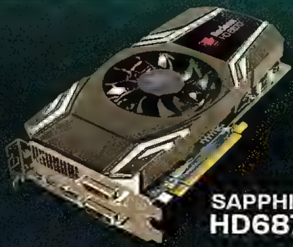
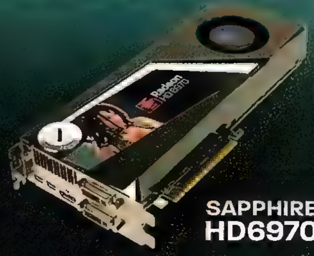


SAPPHIRE HD6850



SAPPHIRE HD6870

SAPPHIRE HD6950



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A modest censorship proposal

Dan Rutter's got a crazy idea about games censorship...

The other day, I thought, "People say that *Risen* is a decent RPG. No namby-pamby hand-holding like *Oblivion* or *Divinity*, but not full-blown German sadism like the older *Gothic* games. I think I'll give it a go."

But alas, I cannot.

At least, not legally. *Risen* is one of the games that's been 'Refused Classification' by the Australian Classification Board.

You know the drill. Australia has no rating for games above MA15+. So unless a game company is willing to cut the naughty bits out of a game, or can persuade the censors that awarding star ratings for throwing people off skyscrapers and selling marijuana cigars in liquor stores are acceptable fare for a 15-year-old (hell-oooo, *Saints Row 2*!), they can't sell that game in Australia. The average PC gamer may now need bifocals and the average 12-year-old may now know their meatspin from their tubgirl, but the ACB cares not for such trivialities.

The creators of *Risen* didn't care to rewrite it to satisfy dummkopfen on the other side of the planet. So we didn't get *Risen*.

Stupid Censorship Stories are a dime a dozen, of course. The funny thing about the ACB is, really, how *few* games they've blocked. Once you filter out the games that were passed unchanged after an appeal and the games that were modified into acceptability by, say, changing 'morphine' into 'Med-X', there aren't many banned games left.

Any normal panel of blue-nosed wowsers could be confidently expected to completely lose their minds over the abovementioned *Saints Row 2*, but what the ACB actually did was realise that *SR2* may be relentlessly violent and profane, but it's also completely *silly*. Even the occasional strangely affecting cutscenes are usually goofed up because the player character's morbidly obese, and clad only in a gladiator helmet and hot-pink mankini. *SR2* was about as likely to corrupt our youth as *Ren & Stimpy*, so the ACB rightly let it pass.

Of fourteen PC and console games that never made it past the ACB, I count only four that were really worth playing. There's *Risen*, and the 2011 version of *Mortal Kombat*, and the infamous *Manhunt* back in 2003, and *Leisure Suit Larry: Magna Cum Laude*. The inclusion of which on my 'worth playing' list should tell you something about the ten that didn't make the cut.

(One of them was *Voyeur* (**http://en.wikipedia.org/wiki/Voyeur_%28video_game%29**), which was not only awful but was also banned by the OFLC so long ago that people not yet born when it was released are now in university.)

This censorship business is still a big old waste of time, of course. Law-and-order politicians keep pretending that anybody opposed to censorship must be a fan of child pornography, but it is extremely difficult to marshal empirical evidence that even art specifically designed to be as filthy and disquieting as possible, like John Waters' *Pink Flamingos* for instance, does viewers, let alone society at large, any real harm.

Given the above, it occurred to me that what we need to do is gently steer our censors and their governmental pals away from banning good games like *Risen*, just because you can kill someone and get a 'weed reefer' as loot. Rather, we should encourage them to ban *shit* games, just as they banned *Singles: Flirt Up Your Life*, and the *Reservoir Dogs* game, which was as bad as the movie was good.

No Australian child should have to bite back sobs when their grandma gives them *Elf Bowling* instead of *Professor Layton*. No Australian teenager should ever have spent hard-earned money on *Daikatana*. And, furthermore, nobody should buy a game just because it's attracted massive negative media hype and they want to see the blood and guts, and then find themselves playing *Postal*.

This'd all put a bit of a kink in Yahtzee Croshaw's business, of course. But sacrifices must be made for the greater good.

The average PC gamer may now need bifocals... but the ACB cares not for such trivialities.

Got any games you'd like banned?
dan@atomicmpc.com.au

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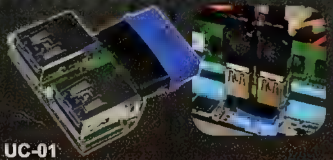

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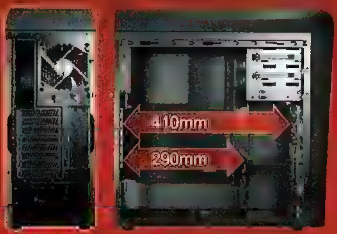

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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

TUTORIAL CONTENTS

ATOMIC.EDU 76
Chris Taylor on working as a tech in the real world.

HOW TO... 78
We show you how to make a fan blowhole.

atomic MAXIMUM POWER COMPUTING WEEKLY NEWSLETTER

Wednesday September 10 2008

Keep up with the latest from Atomic!

Atomic isn't restricted to the pages of this magazine, and there's still plenty more to be had online.
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KITLOG
Issue 3, March 2010
atomic
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Only available at www.atomicmpc.com.au/kitlog

Working as a tech

Chris Taylor takes a look at IT in the real world.

The worst job in the world is dealing with the technical woes of computer illiterate friends and family members. You love these people. You do. But then sometimes you want to sell them to modern day slave traders. 'And then I dragged this stuff into the Recycle Bin to make more room. Can you fix it?' And, 'I clicked the button that said I'd won a free prize for being the millionth visitor to some website and now something bad is happening.' The 'virus' that turns out to be an unplugged VGA cable. The start-up that takes ten minutes due to all the adware and 'helpful' printing and mp3 player utilities. All of this for free. Or, maybe, for a re-gifted bottle of the Liquorland special. We understand. We've been there.

You can get paid in actual currency to deal with peoples' technical ignorance. If you reading this magazine, if you're the ones relatives and friends guilt trip into cleaning up their shit, there's a good chance you have the necessary skills.

If you're technically-minded, working as a technician can be great. After all, you get to play with technology all day. You get the satisfaction of finally cracking problems that have been driving you crazy for hours or days.

Pay and the level of job security vary, although both can be good in larger organisations or in the public service. Both can be terrible, too. 'Technician' is, after all, a very broad term. How well you do – and how stable your employment is – depends totally on the kind of employment you seek. Due to the very nature of technology if you're in the right place at the right time and can quickly come up to speed with new technologies, you may go far. You may also end up in a fairly unglamorous, low-paying position that doesn't really lead to anywhere. If you're thinking of becoming your own employee and basically doing the for-profit version of the family technician gig, you can expect a fairly low ceiling of advancement and opportunity.

In many jobs the work hours can be long and not fixed to the nine-to-five, Monday-to-Friday schedule. A higher paying position might mean accepting that you could be called in whenever something goes wrong, even if that's on the weekend or at four o'clock in the morning.

Whatever you intend to do with your career in the longterm, you'll most likely have to start in a lowly position. It's unrealistic to expect, no matter your qualification, that you can just walk in off the street into some highly paid job.

Paper and other qualifications

Do you need a qualification to do this sort of work? Well, no. The knowledge you need, as you probably, er, know, comes from experience. From years of tooling about with computers. Countless weekends spent dismantling and/or destroying them.

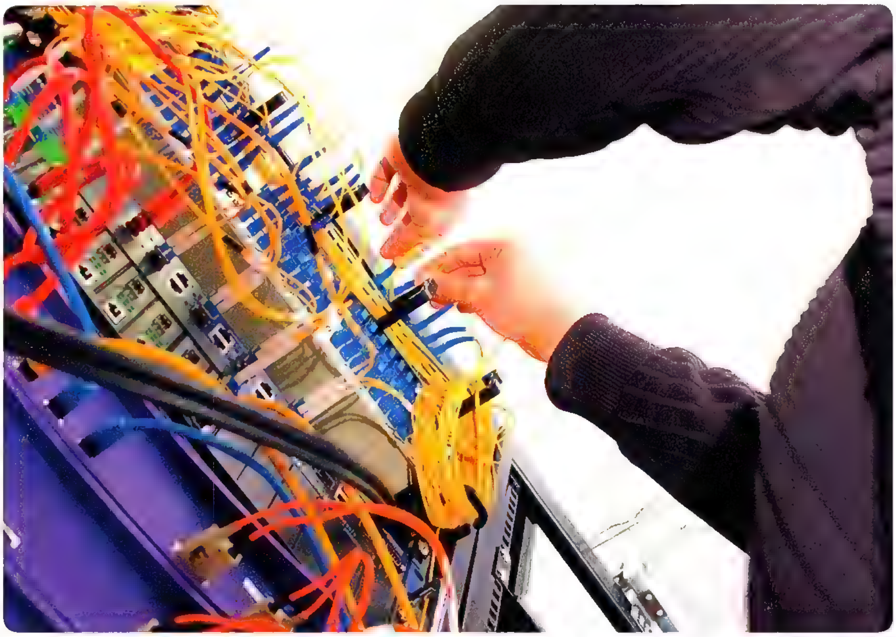
No one working as a tech has all of the solutions to all of the problems. A good technician doesn't necessarily have an encyclopaedic knowledge of everything that can go wrong with Windows Vista, although he or she will obviously have an ever-growing repertoire of common problems and solutions. A good technician is patient and careful. Organisations and customers are relying on him to not make some misstep that loses all of their valuable data or damages their expensive equipment. A technician should also have a lot of patience and accept that the same errors will pop up again and again and again, particularly in businesses and schools.

Figuring out the exact nature of a problem, which obviously requires a fair bit of knowledge, then finding a solution to that problem and applying it is what the job is all about. That knack for problem solving is something people either have or don't. You can't get it at TAFE or university or school.

Going to TAFE is not a waste of time, though. Certificate III, Certificate IV and Diploma level qualifications in Information Technology, maybe with a major in Network Engineering, can be beneficial when you're seeking employment. Some employers may also look for vendor certifications such as those put out by CCNA, MCSE, Oracle and VMWare. Some employers may even want to see a Bachelor's degree, but there are many jobs for people who aren't so highly qualified.

Not just technical knowledge

As with most study and career options we discuss in the .edu column, we feel the need to emphasise the importance of 'soft' skills. It's all well and good to have that encyclopaedic knowledge of computer errors and solutions to those errors, but it's of little value professionally if you struggle to communicate with people in clear and concise language. After all, whether you're working as a self-employed 'nerd for hire' or a school with 500 students, you're going to be dealing with a lot of people who aren't be able to articulate the exactly what they did to the computer or what the computer did in response in as detailed fashion as you'd like. The computer is broken. They were trying to, er, um, move that thing up there, that thing lets you do stuff. You need patience and the capacity to draw out of them usable information. You also need to ensure that when you show them how to deal with issues themselves that you don't come across as condescending or arrogant – qualities that often have a detrimental impact on one's career prospects in this field. You don't want to make your employer feel stupid.



Communication is very important if you're running your own business. Customers need to understand exactly what they're getting for their money – and you need to be able to understand what they expect for their money. There will be people who'll ignore your sagely advice on what to buy or what not to do. And you'll have to deal with their mistakes again and again and again. You'll have to tolerate organisations that value what technology gives them but don't put much money into it, meaning you'll be dealing with systems that have been in place longer than the bulk of the employees.

Depending on your personality, dealing with customers and the technically illiterate masses will be either the best or worst part of your job. As with any kind of service position you can expect some people to treat you as if you're inferior, even if you're really skilled at what you do and are as likeable as Nelson Mandela. There are some customers who'll believe, simply because they don't really understand what you do or have the desire or capacity to learn, that you're ripping them off. They won't see anything wrong with expecting old, underpowered machines to cope with important, demanding tasks.

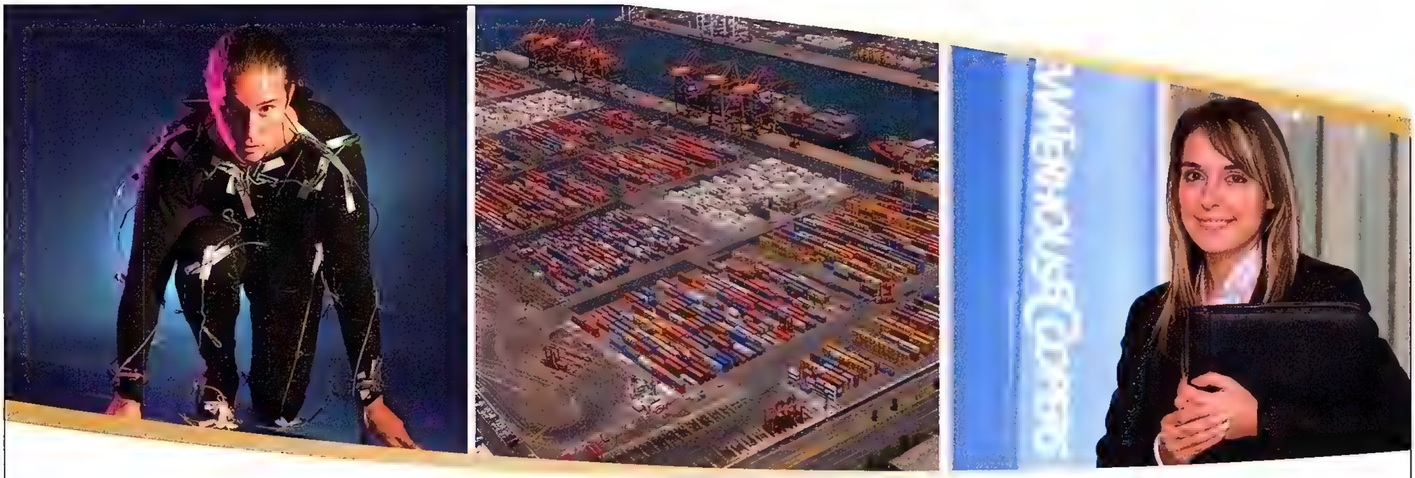
You also need solid organisational and time-management skills, particularly if you're the one technical person in an organisation or are self-employed. You must be able to manage your time effectively and prioritise jobs. If you're in schools, for example, it's really common to spend only one day per week in a given school because you serve an entire suburb's worth of schools. If you don't get around to solving some significant problem today then it has to wait until next Thursday. Principals tend to crack the shits over things like that.

If you want to be self-employed it might be worth looking at a Certificate-level introductory business course. You'll need to know the rudiments of managing your finances, the tax system, marketing and other relevant laws and requirements. You need sales skills, something a lot of technically-minded folks seem to lack. You need a licence and a reliable car, as most clients expect on-site support or will pay a premium for the convenience of it. Many small businesses run aground within a very short time because the people involved lack this knowledge or fail to research their competitors, relevant legislation or the amount of money they can realistically expect to make in profit.

Going the distance

With some basic qualifications and solid problem solving skills, it's very possible to fashion yourself a decent career as a technician. Technical knowledge and a capacity for troubleshooting – so long as they're combined with strong communication and organisation skills – are saleable commodities.

'Technician' is a broad term. Depending on how skilled you are, how lucky you are and how much responsibility you're prepared to or capable of taking on, you can work your way into a gig with decent pay and lots of interesting toys to play with.



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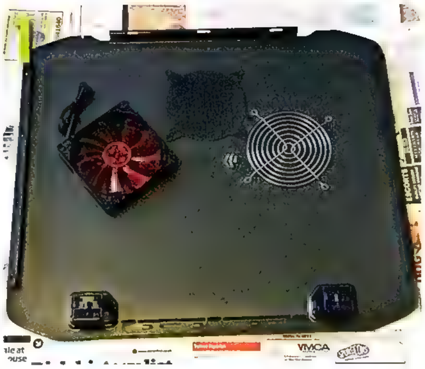
how to... make a fan blowhole

Cutting a hole in your case is easy, but making it look good requires a little more skill and planning. **Antony Leather** shows you how it's done.

A side panel fan is a good addition to your PC for several reasons. It not only improves your cooling, but can also help make an otherwise dull case look more exciting. In this guide, we show you step by step how to cut a blowhole and install a fan, complete with dust filter, in a side panel.

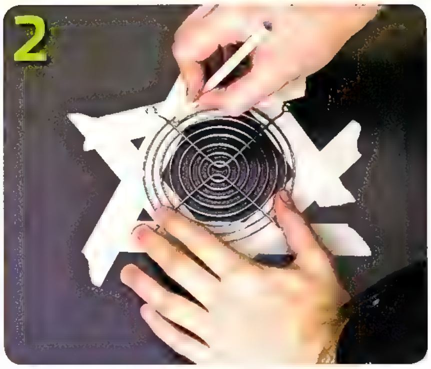
tools you'll need

- Cutting tool (jigsaw, holesaw or Dremel Trio) with blade or attachment for cutting steel or aluminium
- Drill and drill bit
- Fan grill
- Fan filter
- Blowhole trim
- Metal file
- Masking tape



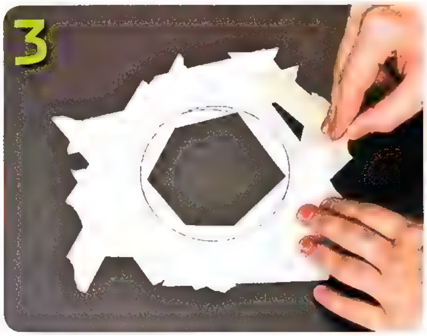
CHECK THERE'S CLEARANCE

It's important to ascertain whether your case has room for a fan in the side panel. Check the clearance behind the spot in the panel where you want to mount the fan – your CPU cooler or graphics card might foul the fan when you try to attach your side panel. Stick a fan to the inside of your side panel using a small amount of double-sided tape. Then try to close the panel – if there's enough room, you should be able to secure the panel as usual.



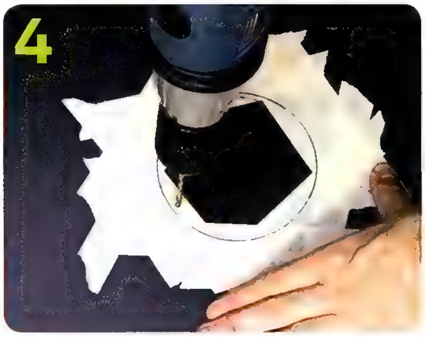
MARK UP

The easiest way to mark up the side panel is to use a standard circular fan grille. Place the grille over the fan to see which ring best matches the diameter of the fan's exhaust hole. With a pencil, use the grille to draw a guideline to mark the fan blowhole.



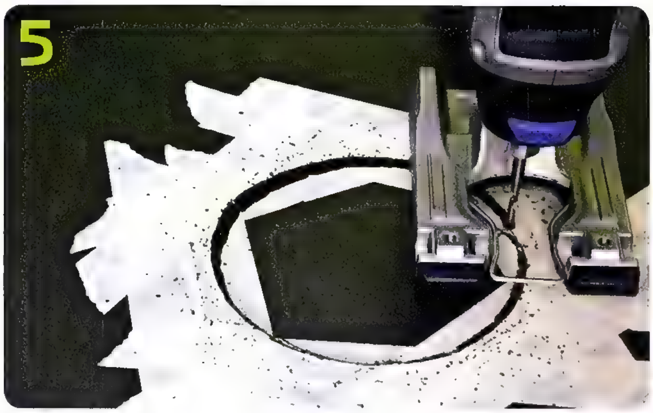
PROTECT YOUR PAINTWORK

Take precautions to prevent your side panel getting scratched. Cover the outer side with newspaper to protect it while you're cutting. Use a ruler to mark the position where your fan is to be mounted, then mask off the area on the inside of the panel with generous helpings of masking tape. This prevents any slips from scratching the paint.



DRILL PILOT HOLES

We used a Dremel Trio to cut our blowhole, but a jigsaw with a metal-cutting blade will work too. Alternatively, consider using a large holesaw attachment for your power drill – they typically cost less than $30. However, this isn't the best tool for the job, particularly if your case is made of steel. If you need to drill a pilot hole for your blade, make it a little way in from the guide line you drew earlier – this will give you some margin for error. If possible, practice by cutting a piece of scrap metal first.



5

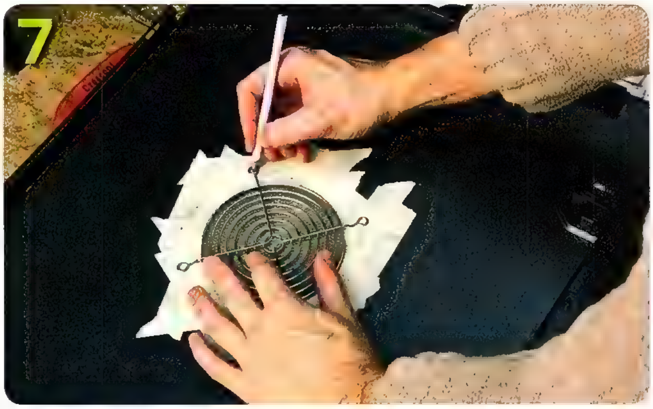
START CUTTING

Cut on a solid surface and use safety goggles. Don't try to perform the entire cut in one attempt. Stop at regular intervals to check your progress. As you come to the end of the guideline, take the process slowly – all tools have a tendency to jerk at this stage. We used tiny bursts of power on the Dremel Trio, gradually eating into the last few millimetres of metal. There may be large metal protrusions between the start and end cutting points. If you can, use the tool to gently cut these away, as this can save you a lot of time filing.

6

FILE THE EDGES

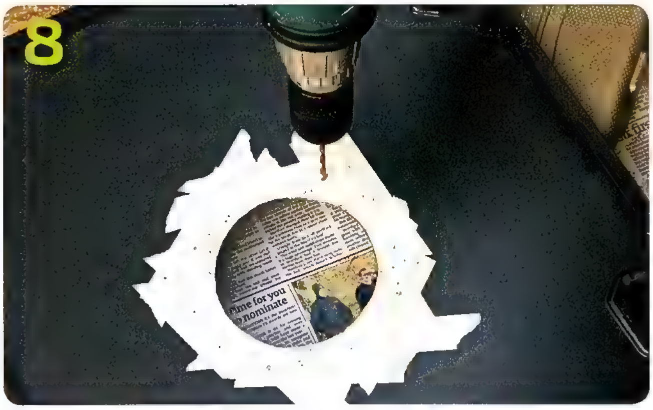
There will be sharp metal shards around the edge of the blowhole. Be careful not to cut yourself on these. To remove them, use a metal file. Work your way around the hole using long, firm strokes until the hole is smooth with no protruding metal shards.



7

MARK THE FAN SCREW HOLES

Place the fan grille over the hole you've made and line up the rings so that they're equidistant from the hole all the way around. Use a pencil to mark the four mounting holes on the masking tape.



8

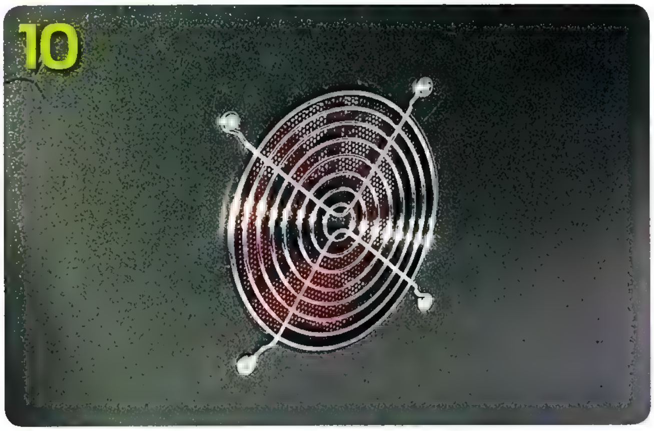
CUT THE FAN SCREW HOLES

Select a drill bit that matches the size of the thread on the screws you're using. It's worth making absolutely sure that the markings for the screw holes are aligned properly before you drill the holes. Then fit the drill bit to the drill and make the holes for the fan screws.

9

FIT THE FAN BLOWHOLE TRIM

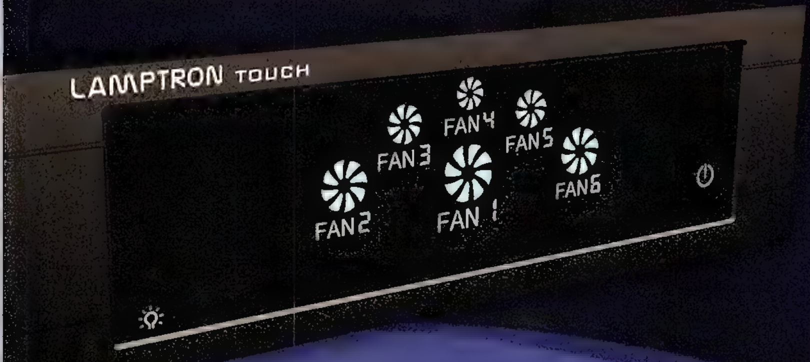
Push the fan blowhole trim onto the edge of the blowhole. Cut it at a point where the ends overlap by 1-2mm. Then prise the end in behind the rest of the trim. This will ensure that there's no gap between the two ends, which would look unsightly.



10

INSTALL FAN, FILTER AND GRILLE

All that's left to do is to fit the grille, filter and fan. Your panel will look best with the filter mounted on the inside of the side panel. Place the filter on top of the fan, and lay the side panel on top. Place the grille on the side panel, lining up the holes, and secure it to the fan beneath using the fan's screws.



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LT-FC5V2

5-Switch
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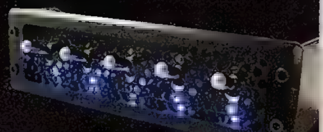
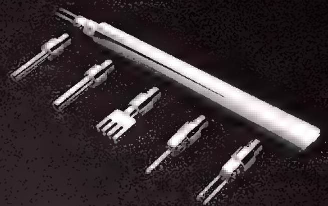
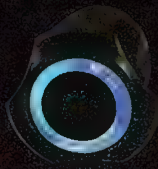
LT-HUMMER

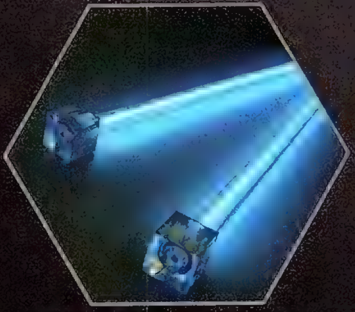

5-Switch
Illuminated Alum
LT-FANATIC

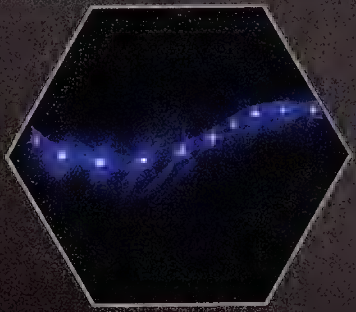
4-CCFL Inverter
with Alum housing
LT-INV-4

Advanced
Slot Protector
LT-SLOTPRO-BK


PSU
Modding Toolkit
LT-MODKIT


Illuminated Tri
Switch
LT-TRISW-BL


CCFL All-in-One Kit
LT-CCFLKIT-BL


FlexLight PRO
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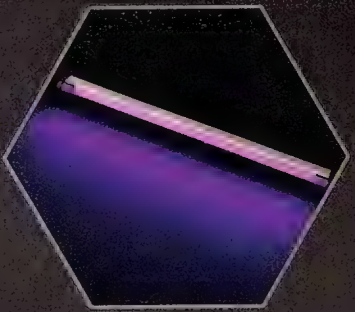
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GAMEPLAY

GAMES, GAMING AND GEEKERY COVERED... ATOMIC-STYLE

As the weather gets cooler and less clement, and the outdoors decrease their greatness levels, our PCs and gaming consoles get more and more of a workout.

Which suits us just fine actually. Let's face it: winter isn't just so much a reason to stay home and spend a bit more time with our favourite games. It's just a handy excuse we pull out sometimes.

And it's not like gaming companies don't know that, so this month sees a whole slog of new releases competing to become our gaming hot water bottles on those chilly winter nights.

We've got the verdict on Rockstar's big release for the year, as well as that Parkour game we told you about a while ago, a look at World of Tanks, which is finally actually getting a release after years in beta, and plenty more. Onwards!

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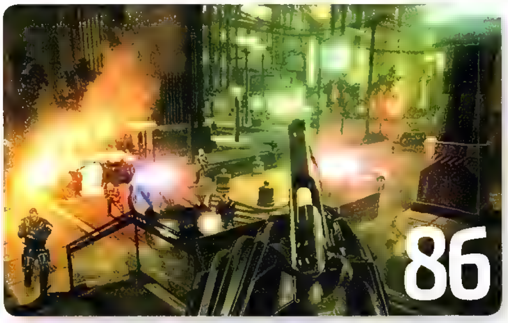

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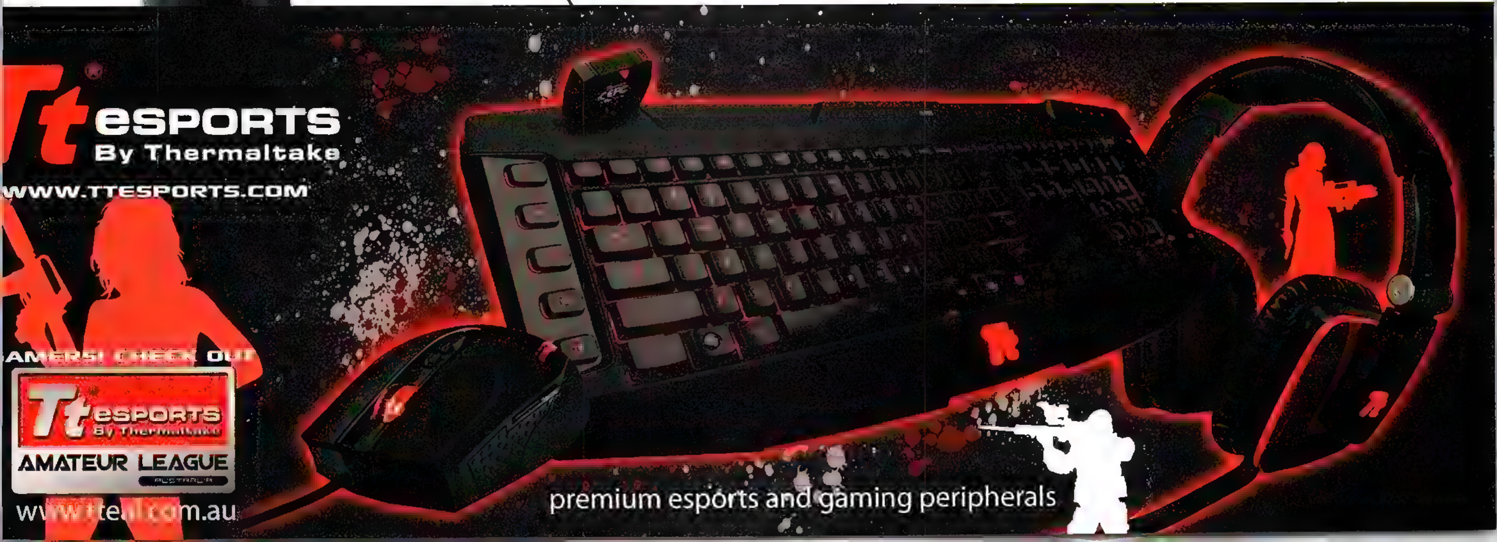
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The Witcher 2: Assassins of Kings

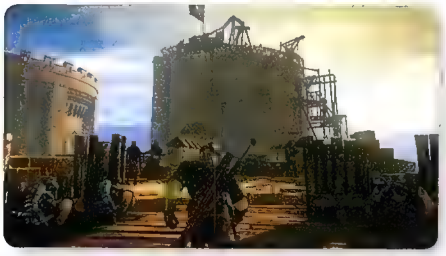
Geralt is back, and full of sword-wielding action in this instant RPG classic.

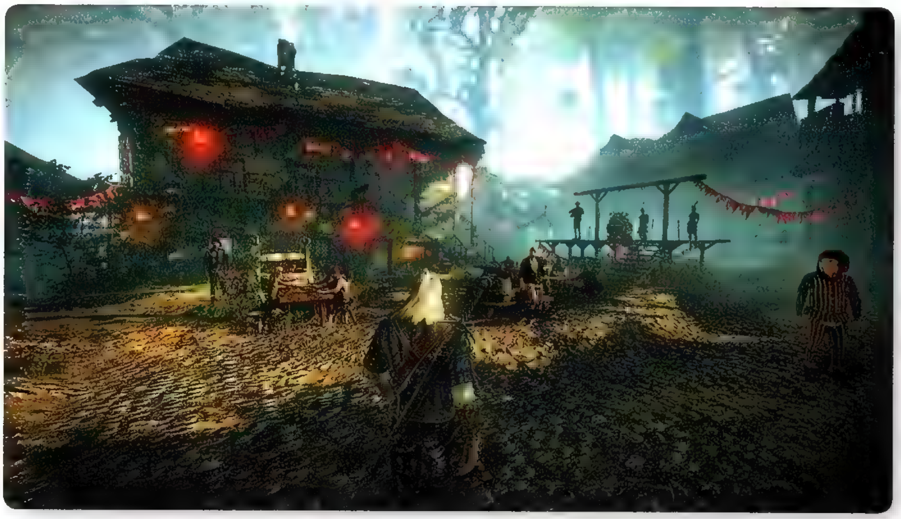
Polish games developers CD Projekt RED certainly had a tremendous task ahead of them when they announced there would be a sequel to their surprisingly successful 2007 RPG, The Witcher. 'Surprisingly' successful because CDPR were a then-unknown first time games developer who had built its business model on localised games publishing, not development. Based on the world created by Polish author, Andrzej Sapkowski, the original game brought to the table a very rich game world, complete with morally grey characters, an engaging storyline and a complex decision-making matrix. Fans would be expecting... a lot.

Once Upon A Time...

Yeah, plough that for a beginning: this is not your average fantasy story. The world that protagonist Geralt inhabits is a grim place to be and the Prologue dumps you right in the middle of it, with human war spilling onto the grimy Temerian streets. Castles are understandably ornate with majestic views; however, townships are grotty and populated with townsfolk who have the hunch-shouldered demeanour of those who endure hardship simply because they know they must. Forests, by contrast, are lush and beautiful on the surface, but dangerous on account of the native wildflife (the empahsis on 'wild') and deadly tensions escalating between humans and rebel non-humans.

The game picks up the story one month after the conclusion of the last chapter. The Prologue serves as a tutorial and the story unfolds anachronically depending on the dialog choices the player makes. Although this may cause some measure of narrative confusion, which will no doubt appeal or alienate, the relevant tutorial points are displayed as required no matter which dialog path you take. All tutorial tips are recorded in Geralt's journal, and since the in-game pop-ups could only generously be described as unobtrusive, it's wise to spend





time reading through these.

As this is a sequel, you have the choice between rolling a new character or importing your save game files. There are four difficulty levels – the standard Easy, Normal and Hard levels, and the appropriately titled Insane. It offers the hardest opponents of any difficulty level but also the threat of final death – if Geralt dies, no save game can be loaded. Ouch.

This is a mature game in more ways than one. There's plenty of foul language, although much of it is made up of quirky game 'verse euphemisms. The notorious sex cards from the first game are gone, although not what they were used to represent, so if you don't like the idea of male or female nudity, then this is not the game for you.

However, the maturity of the game doesn't just come from violence and nudity, although it has plenty of both. One of the strengths of the franchise is that it assumes a certain level of intelligence from the player: the writers have not been afraid of weaving a deep and complex storyline. That this is a sequel should not deter new players who have not played the first game, either – as involved as the story is, the narrative itself is easy enough to understand even without the context of the original. For those of us returning from Lakeside and the Ice Plains of the first game, however, there's plenty to appreciate here with plenty of references and affectionate nods to the first game.

Despite being a fantasy RPG, the concepts of Good and Evil are virtually non-existent and all characters have their own shades of grey morality. Within this framework, the concept of choice takes on a much more serious tone as consequences are not always immediately apparent nor are they limited to superficial spats or strained personal alliances. Choices can have dramatic consequences that only become clear much further down the narrative track, or even open up or close down significant portions of the narrative: the game boasts four different beginnings and an impressive 16 different endings.

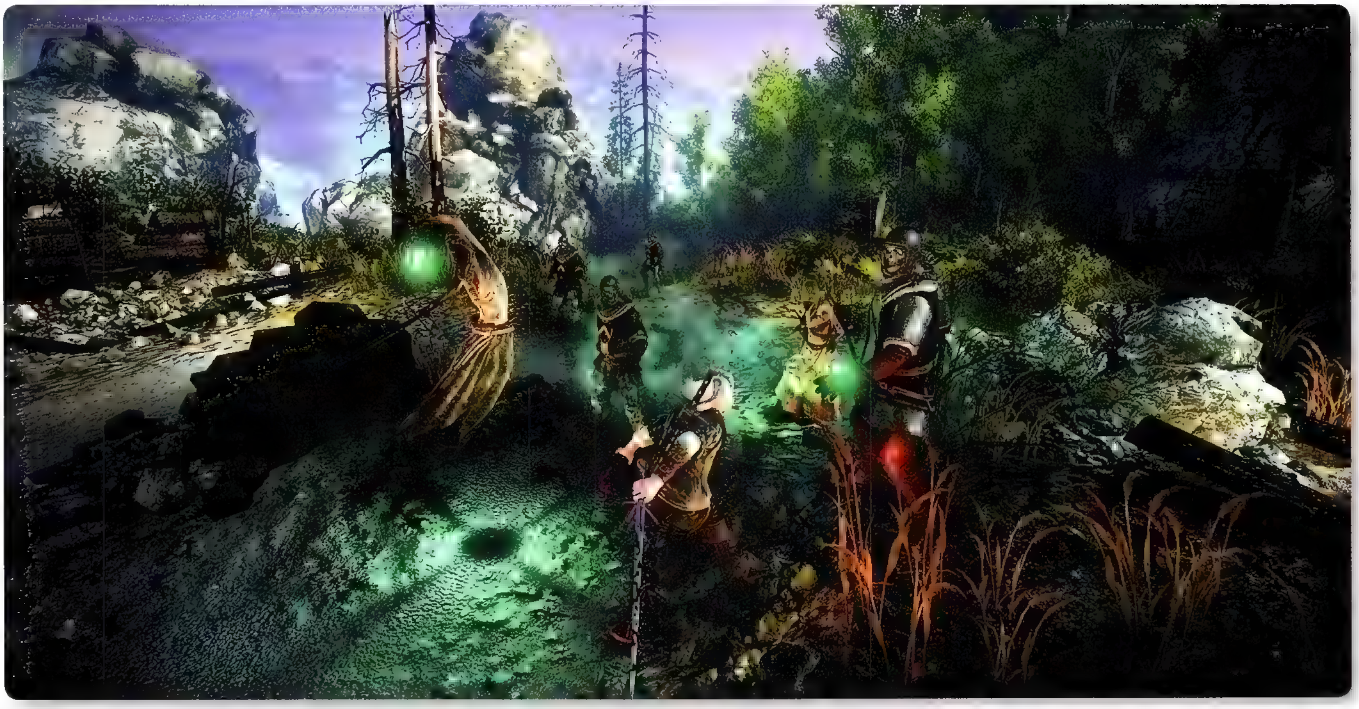
The Little Engine That Could

The characters may be morally grey, but the visuals are anything but. Put simply, the game is a visual feast, due in no small part to CDPR's development of its own custom engine, appropriately called the RED Engine.

Slimy beasties glisten in the dank caverns underground while the sandstone castle walls glow warmly in the slanting afternoon sun above. Lighting is dynamic and computed in real time, as opposed to using the light map technology from the first game, which lends a sense of realism to the environments and day/night cycles.

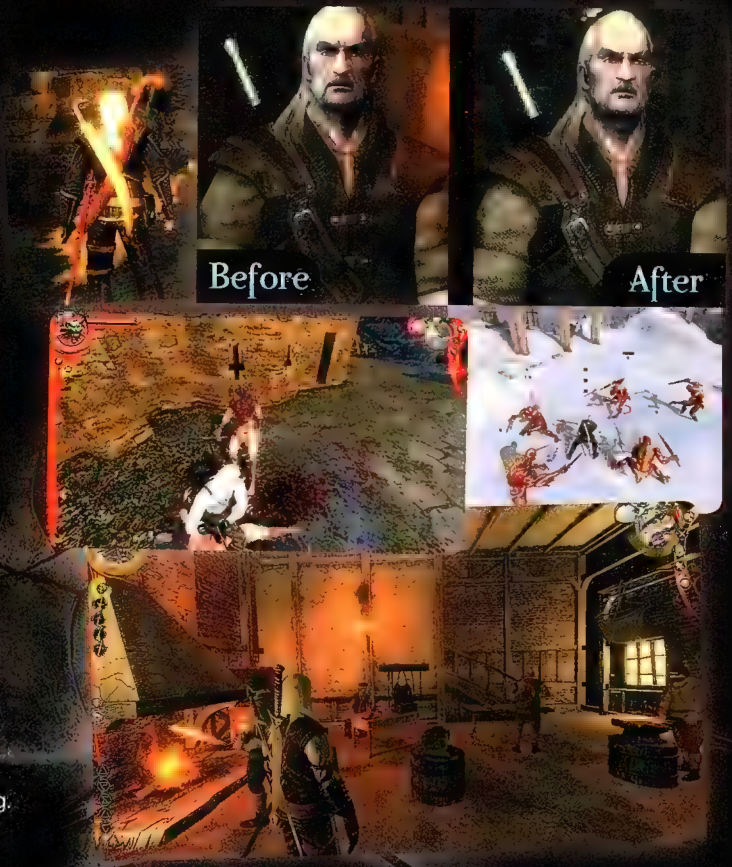
But really, we could sit here all day and talk about the ocular pleasuring the game offers – it's pretty. It's really pretty. Let's move on to something a little more dynamic: combat.

Love it or loathe it, the combat system has been overhauled and can certainly be considered an upgrade over the previous,



Witcher mods

Some might say that The Witcher is perfect all on its ownsome. Modders, usually, say different. There aren't a huge range of mods for The Witcher however, at least compared to games like Oblivion, as the Djinni adventure editor wasn't released until a year after the game. But that doesn't stop the passionate, so here are some of the best Witcher mods for your playthrough extravagance. This list doesn't include user-made quests and stories, some of which were good enough to be included in the Wither Extended Edition. These, along with the mods listed here, can be found on moddb.com.



Full Combat Rebalance

www.moddb.com/mods/full-combat-rebalance1

This is the big one, over a year in development, and aims to rebalance pretty much everything. Its two core features are a skill-tree overhaul including the addition of an entirely new sign – Heliotrop – and a re-working on the (sometimes frustrating) combat system. And not to make it easier: instead making fights more brutal, with the ability to fell opponents which just a few swipes (or less, if you're good). It's great in practice, giving combat a lethal fluidity. But of course it goes without saying that you, too, can be felled easily if you don't block and dodge. The author encourages users to install FCR, but to not raise the in-game difficulty past 'Normal'. There are too many other changes to list – many balance issues, fixes, and tweaks – as the mod contains over 2000 files. It literally is a whole new Witcher experience, and one well worth enjoying.

Scabbard mod

www.moddb.com/mods/scabbard-mod

The Witcher is beautiful and the attention to detail in the world is insane – but have you ever noticed how swords appear to hang on NPCs as though through some magical invisible twine? Scabbards for swords were originally planned for the Witcher but dropped due to clipping problems. Not that this should stop some enterprising modder from giving it a go.

The scabbard mod does as it says on the hilt, adding scabbards to swords for both Geralt and, optionally, NPCs in the world. Unless you're looking for it, you won't notice the clipping, which is most obvious around Geralt's hair. But this simple tweak really does add a lot to the game. And as a bonus it includes some improved sword models for some of Geralt's popular swords.

Witcher Texturen Mod

www.moddb.com/mods/the-witcher-texturen-mod

Yes, this is a 1.4G download. You could say it's a tad large. No more so than Zoltan's gut, though. All you need to know is that you need to download it. And, importantly, it's an updated patch (at the same link).

Texture mods can be a matter of taste for some games, but these don't replace the originals, only resize and sharpen them to bring out details and it works beautifully. For its time, Witcher was already a stunning game and the Witcher Texturen mod really makes it shine. The mod replaces textures for buildings, walls, objects, animals, terrain, armor, minimaps and special effects – some 3000 files in all. Everything, in fact, except character textures. But wait, this isn't an oversight – because just like in that Cupertino app store, there's a mod for that.

Hi-Res Character models

www.moddb.com/mods/witchercharactermodels

Complementing the Witcher Texturen mod is this, which focuses on the NPCs and monsters in the game. As with its sibling, these aren't new textures but use the original ones resized and sharpened to show added detail. A side effect of this is that some of the game's original textures came at various levels of resolution and detail, and so the mod too still shows differences between higher and lower quality textures. But is it worth installing? Absolutely! If not for the way it enhances the faces and clothes of every NPC you meet, then surely for a higher detailed and prettier Triss to gaze at. Ah Triss... which girl did you choose?

Perfect Blood and Perfect Rain

www.moddb.com/mods/the-witcher-perfect-blood-mod
www.moddb.com/mods/the-witcher-perfect-rain-mod

Because both blood and rain *should* be perfect. These are two separate mods by the same author, and both focus on improving the little details. The rain mod is an easy choice – the original game gave too heavy an emphasis on the rain textures, this mod corrects that by creating a more subtle effect.

Perfect blood is on a similar vein (ha! geddit? no? ah well..) and replaces the blood textures with more realistic looking versions. It also enables a hidden feature that was initially disabled in the game because doesn't always work perfectly – wound marks. It works well enough though, and you get to see great stonking slahes on your enemies while you're (literally) tearing them a new one.

Extreme immersion

www.moddb.com/mods/witcherextremeimmersion

The Witcher is a beautifully atmospheric game, but that interface is a tad large. The Extreme Immersion mod helps you further fall into the world of the Witcher by removing almost all UI elements. This works well because most functions have in-world counterparts, so you shouldn't want. Those with no equivalency get to stay. The only caveat is the combat icon that lets you know what combat style you're using is also gone, which means you'll need to recognise the styles by the way Geralt holds himself. Ultimately, this is actually a far better way to really get to know your fighting styles, so you can bet Geralt would approve. **AM**

which relied on a chain of timed mouse clicks and turned into a point-and-click-click-click affair. Geralt still sports his iconic dual swords (steel for human foes and silver for monsters), and in a refreshing nod to OH&S standards, now carries them in scabbards. The player also has access to additional weapons as the game progresses, including throwing daggers.

Combat is more tactical and free-form, and playing on any difficulty level other than Easy means that trying to click-hack your way through a battle will result in a swift death. To put it bluntly, the learning curve here can be quite steep and the game can be damnably unforgiving. Success in combat relies on the player making use of Geralt's impressive swordsmanship and subsidiary abilities, including alchemy and magical Witcher's Signs. And there's a definite sense of glee that feels oh so wrong yet oh so right when you use a telekinetic blast wave, Aard, to send an enemy flying from the top of a castle wall.

The new Quick Menu system slows time to a crawl and brings up an interface allowing you to do extra combatty things, such as swapping between Signs. Admittedly, it takes some getting used to, although once you're in the groove the combat experience becomes much more manageable.

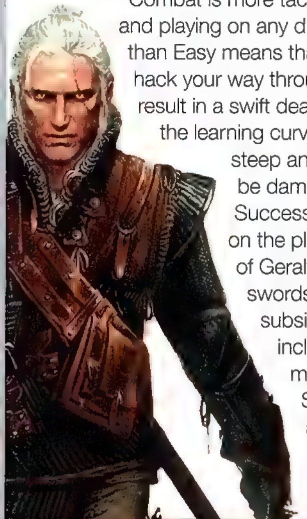
RPG-favourite Alchemy and it's cousin Crafting are used to create potions, oils, bombs and craft useful items such as gauntlets. It's pretty standard RPG fare: earn the talent, harvest the items, collect recipes or instructions. Assembly (or brewing) is done while Geralt is meditating, something that must be done outside combat zones although this is just about the only restriction. Alchemy and combat are cleverly linked, as potions can only be consumed while meditating, which means there's no more casting of Quen, a magical shield Sign, and sneaking a tipple of Swallow in the middle of a tough battle.

Stealth missions are certainly not a new concept to veteran gamers and TW2 doesn't bring anything new to the table in this regard. However, they are a departure from the standard run-walk-run modes of gameplay and let's face it, who doesn't enjoy getting a little tactically down and dirty with Geralt? Tactically, I said!

However, the game isn't all about the combat. To support the strong storyline, there's plenty of NPCs to talk to and plenty of ways to go about it. Some of the dialog options are now flagged with icons to indicate special status. The usual RPG-flavoured favourites are there – Trade, Intimidation, Persuasion – as well as some universe-specific options, such as opening up the Dice Poker minigame or having Geralt use his charming Axii Sign to influence the direction of a conversation. This allows the player to make more informed decisions and take more control over the direction of a discussion.

As many a sorceress can attest, there's plenty to love about the witcher and the sequel vehicle for Geralt is no exception. There's a lot to learn and the game certainly won't hold your hand while you do it, but the rewards are there (and they're not limited to pilfered orens!) for those who like a challenging and mature gaming experience.

Ultimately, one important thing to keep in mind when regarding TW2 is that one person's change is another person's evolution. The Witcher 2: Assassin of Kings represents a maturation in almost every respect: graphics, combat, and storytelling, while still remaining true to the core elements that made the original game such a satisfying experience. **EW**



PC

Developer CD Projekt RED
Publisher Bandai Namco
Website www.thewitcher.com

Gameplay Epic in story, scope and strategic combat.	95
Graphics Richly detailed; scales well on older hardware.	96
Sound Superb voice acting with a cinematic soundtrack.	92

Overall
A worthy sequel, and contender for RPG of the year.

94%

Deus Ex: Human Revolution

We go hands on with one of the most anticipated action RPGs of the decade.

From the first trailer, we've been fans before the fact of Deus Ex: Human Revolution. When you're a fan of books like William Gibson's Neuromancer, or TV anime like Ghost in the Shell: Stand Alone Complex, everything about the world of Deus Ex that those early trailers promises seems bright and golden. The music, the fashion, the sense of drama and gravitas... this, we've always thought, is a game that we'll be able to get our teeth into.

But there's a trap there – the same trap that we fell into with Homefront. And it's one that's almost impossible to avoid if you're like us. When that game you're really handing for comes out, there's a good chance it simply won't live up to the hype that you – and the game's publisher – has built up around it.

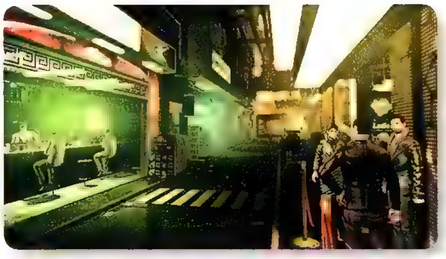
So what does this mean for Deus Ex? Well, we've had a few hours of hands on time with the game, with a very limited build, and we've come away... cautiously hopeful.

We can rebuild him...

Regardless of anything else, Deus Ex certainly starts with a punch – almost literally! As Adam Jensen, head of security for cybernetic powerhouse Sarif Industries, you start out getting a colleague – whom it appears you're romantically linked to – ready for a conference, when everything pretty much goes to hell. Sarif's HQ is under attack, and your attempt to repel the well-armed and heavily augmented mercs behind it goes horribly wrong. Your girl ends up dead, her top-secret project trashed, and you wind up on an operating table relying on cutting edge cybernetics to keep you alive.

It's like an interactive version of the Six Million Dollar Man credits – but without the wang-a-nang-a-nang noises.

It's a pretty brief sequence, but it does a good job of delivering a lot of information. We learn that the world is on the cusp of incredible advances and man/machine interfacing, but at the same time there are many parties who want to see this convergence stopped in its tracks.



We meet the owner of Sarif Industries, and get an idea of the lengths he'll go to see that his company dominates the bourgeoning field of cybernetics, and we also get a personal hook into the unfolding story of who might be behind the attack on Sarif. And, it's a handy primer into the game's basic shooting and cover mechanics.

From there, the game skips ahead six months, to a more or less healed Adam rejoining Sarif. He's now nearly fully augmented, with almost no part of his body now completely biological. In fact, one of the clever things the game does is only give you a full HUD at this point, as part of your suite of upgrades. The next few levels introduce hacking, more stealth play, and eventually open up the full range of cybernetic upgrades you can unlock in your new body. It appears the trauma of your original injuries makes turning on all your new parts problematic, so they need to be brought online gradually – a very clever way to make the game's XP and upgrading system perfectly natural and a part of the world.

This gradual immersion into the world is done very well – and it has to be. The game features a very rich world, and some incredibly deep gameplay mechanics. For instance, without the benefit of a proper game manual, and with many of the tutorials within the game still plagued with placeholder text, we're still unsure of exactly how hacking works. We can do it (and enjoy it), but we're not sure if we're making the most of it. Combat, even at a medium difficulty, is decidedly brutal, and the game's AI is very good at not only spotting you, but also suppressing and flanking you. If the game feels a little slow in getting started, it's because you need to learn how to operate in order to stay alive.

And speaking of staying alive, you'll need to master the game's cover system if you want to be at all combat-effective.

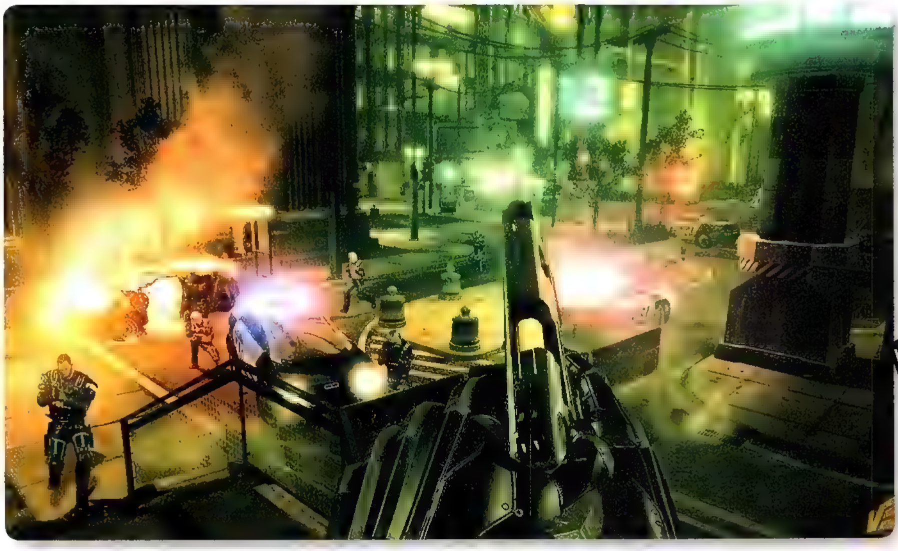
But is it Deus Ex?

The real thing the preview answers is whether or not Eidos been able to recapture that open feel of the original. So far, they seem to have succeeded – most missions are open enough that you can sneak, stealth, fight or sometimes talk your way through them. There's a range of lethal and non-lethal options, and you can choose to quietly take-down enemies in hand-to-hand both lethally and with a mind to them maybe waking up at some point in the future. Whether or not these decisions have any impact down the track – like becoming known for being a cold killer, for instance – is outside of the scope of our preview build.

There's a broad variety of conversational options, and it often pays to talk to everyone you can – in one instance, talking to a cop outside a building clued is in on a possible advantage we could use over someone inside.

Similarly, listen for audio cues. We were hailed by what appeared to be street walker while wandering downtown Detroit, only to find out when we investigated further that the woman in question was an undercover cop – who had an interesting side-quest. There are no floating question marks or map indicators for these kinds of NPCs, which makes the world that much richer and rewarding.

Given the promised scope and weave of the game, it's hard to adequately judge how Deus Ex is shaping up from such a limited preview, but we're certainly looking forward to getting deeper into the game. **DH**



Xbox, PS3, peviewed on PC

Developer	Eidos Montreal/Nixxes Software
Publisher	Square Enix
Website	www.deusex.com

✓ Great gameworld; awesome music; open play styles.

✗ Looks a little port-like; steep learning curve.

Anticipation rating

We're optimistic, but we've only seen a little of this big game.

80%

atomic
REVOLVER

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LA Noire

Rockstar releases another crime epic, but great technology and acting cannot obscure a deeply flawed game.

There's a lot to like and admire about Rockstar and Team Bondi's (go you little Aussie developer, you!) latest game, LA Noire. It's a sprawling crime epic set in post-WW2 Los Angeles, packed with a cast of characters that have walked straight out of a James Ellroy novel. It has a facial animation system that pretty much buries the uncanny valley, and allows for nuanced character interaction of an unsurpassed nature. There's at least 20 hours of solid gaming here, too, and much more if take your time. But.

There's always a but, these days, but LA Noire's exceptions are pretty serious. We're not talking about bugs or graphics flaws, either – though these are present – but rather deep issues with the game itself.

Assault and battery

The noir genre is, at its heart, a starkly violent place. It's a world of betrayal and sharply delineated gender roles, where the emotions run high and shadows hold corruption and danger. LA Noire gets a lot of that right; you play as returned soldier Cole Phelps, and you follow his rise through the LAPD from beat cop to detective. Along the way you solve murders, street crimes and arson.

And you leave a lot of bodies in your path, both those you've killed yourself, and those you'd tried to avenge.

On paper, it's not so different to other Rockstar titles, like GTA or Red Dead Redemption. But in a lot of ways, those games hold to the noir feel much better than LA Noire. They're tales of bad men trying to do right, and if they can put away some bad men as they go, so much the better. In LA Noire, however, Phelps seems far more of a cipher – we see a lot of flashbacks to his time in the Marine Corp, but these really don't fill in much more about character's motivations, or even his true self. It's easy to imprint on John Marsden, and even to make him 'your own' character, in a way, but Phelps... Phelps is a cold fish, at times quite unlikeable. There's simply too much distance between the player and character.

A lot of this comes down to a conscious design decision. LA Noire is really more of an interactive movie, a game that harks back to point and click adventure games more than its open world brethren (hell, you can't even go into free roam in LA in the main game – when you complete a case you cut to the start of the next one). You'll spend almost as much time watching Phelps as controlling him, and it's in a lot of these sequences that the game seems to put up roadblocks between the game and the player. We not only watch Phelps make poor decisions that we have no control over (like allowing someone to draw a gun and shoot a suspect), but we also watch him silently take part in some brutally misogynist behaviour.

Popping questions

The heart of the game, however, is the detailed questioning of witnesses and suspects. Without the stunning facial animation technology Team Bondi has developed, this would be impossible – you can read the bunching of muscles, the tell-tale flicks of the eyes, and a myriad other subtle tells to discover lies and inconsistencies.

When it works it's great, but it can also be supremely frustrating when you, the player, discover an inconsistency that the game doesn't let you make use of. Even more glaring, is the way Phelps tends to vacillate between emotional states as he takes different tacks – one moment he might be quietly respectful, then another threatening someone with a beating. It's like he's both alarmingly bipolar and borderline autistic.

Despite all these flaws, LA Noire's still undeniably a great achievement. It's dark, mature and researched almost to a flaw. That it's not perfect is almost a symptom of the game's ambition, but it doesn't change the fact the game is a largely erratic affair. There are moments of brilliance, but also ones where you'll want to put the controller down and take a long break. **DH**

Xbox, PS3 (reviewed on Xbox)

Developer Team Bondi
Publisher Rockstar Games
Website www.rockstargames.com/lanoire

Gameplay At times rich, at other times deeply frustrating. 73

Graphics Some mild glitching doesn't detract from a brilliant depiction of LA. 92

Sound Flawless voice work, and use of music. 98

Overall One of the challenging games we've ever played, for a lot of reasons.

78%

Brink

An incredible vision of the future falls short of an incredible gaming experience.

Brink is one of those games that is bursting with great ideas. It's got a wonderful setting, a wide range of things-that-go-boom and a very unique aesthetic. It even brings in-vogue parkour-style free-running into the FPS genre, offering players a wholly new way to run-and-gun.

However, it seems that good ideas – much like good intensions – often pave the road to gaming hell.

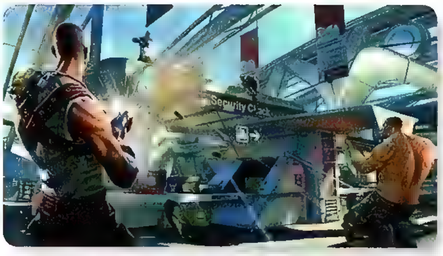
Rising tide

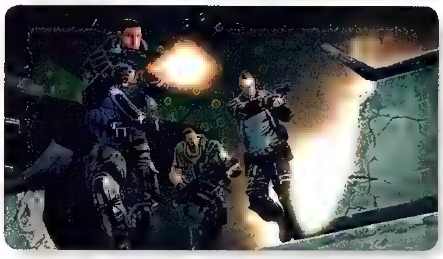
Like a lot of recent upcoming games, Brink's set in a world on the edge – or, more accurately, over the edge – of an ecological disaster. Global warming has lead to rising sea levels, and one answer has been the Ark, a floating city. However, things have gotten out of hand and refugees from slowly sinking coastal areas have flooded the utopian city, turning the previously safe haven into an urban sprawl of haves and have nots.

The game revolves around two factions – the Security forces, who want to maintain the unity, safety and sovereignty the Ark, and the resistance, who want to escape. It's a kind of odd conflict, though, as it seems to us that if there's a group of violent trouble makers going to so much effort to leave... perhaps you should just let them go.

The two sides are starkly different in their design, though mechanically identical. The security forces feature clean para-military uniforms, while the resistance features a grubby, almost punk look. Even the two parts of the Ark that missions take place on are similarly styled.

This bold aesthetic is taken to an almost TF2-like extreme when it comes to facial design and body shape. Features are caricatured, and animation similarly warped. It makes for a unique look, sure, but it also works against the apparent grimness of the setting – we kept expecting more humour from the game's characters. This is the first jarring disconnect the game delivers, but, sadly, not the last.





Too fast, too furious

The actual game is also a curious affair. There singleplayer, co-op and multiplayer modes, but they all offer not only the same maps, but the same missions. Essentially, they're not different modes at all, and you could easily ditch the idea of them being different parts of the game by simply including an option to alter the number of bots in any given match.

To that end, there's very little point in going through the singleplayer campaign, unless you want to get some experience and upgrades under your belt, because the patchy AI and spawn-run-die gameplay renders playing alone a frustrating experience. Co-op can be fun, but again, you're held up by poor AI, both on your team and fighting against you. The full multiplayer's arguably the highlight, but even this has its flaws.

Brink revolves around a changing set of objectives that you must protect, blow-up, hack or escort to victory, usually one after the other. So, you might need to free a prisoner and then escort him to a waiting vessel. Along the way, you can also use a hub-style menu to choose other objectives to go after, which could include healing other players, taking out enemy command points, or any number of contextual things. The idea is that the battlefield is constantly evolving, and you have to keep up with it; you can even change your class at command stations to respond to new objectives.

In practice, though, you end up with a way too hectic, often conflicting mess. A lot of this comes down to how essential the objectives are to winning – get a bad team (or dumb AI), and you're behind the eightball right away. But the pace of the game is often too fast to get a feel for what needs doing. You might only just be getting into the groove of defending a certain chokepoint when the whole objective switches – many games (Bad Company 2 comes to mind) feature this kind of rolling gameplay, but Brink goes way over the top.

Too, the environments really work against any kind of flow. They're mostly built up interiors, multi-level rooms linked by tight corridors. It's difficult to get an overall sense of the action, and overcoming that learning curve seems a chore that delivers little real payoff. And it doesn't help that the game's biggest 'draw', the SMART parkour system, actually falls flat. In Assassins' Creed it feels special, because only you can do it; in Brink, everyone can, and it loses polish because of it. What's more, since sprint and SMART use the same key, it can be hard to keep proper control as you traverse the busy map levels, and a lot of the parkour animations lock you in for crucial seconds of gametime. Rather than being special, it just ends up being frustrating.

Finally, the game's actually quite buggy, even after multiple launch patches. Sound drops in and out randomly, while lag spikes make accurate fire and even movement seriously problematic.

We wanted so much to like Brink, and maybe it's just that a lot of the design choices don't sit with what we want from an FPS, but at the end of the day the ultimate expression of our disappointment is this – it's one of the fastest games to be uninstalled from our gaming rig in a while. **DH**

PC, Xbox, PS3 (reviewed on PC)

Developer Splash Damage
Publisher Ubisoft
Website www.brinkthegame.com

Gameplay 58
Great ideas let down by poor execution.

Graphics 79
Some great design, but ultimately lost on the game.

Sound 80
We do like the soundtrack, however.

Overall
A mighty gaming leap that falls very short.

64%

World of Tanks

Can a free-to-play, vehicle-based MMO actually work? You bet your turret it can!

Is there any conflict nobler than World War II? It had everything – it was the last great war of manoeuvre, featured a clear villain, and featured all arms of the military going hell for leather at each other. If you're a war-nerd, it's the last great conflict; everything else since then just leaves a sour taste in your mouth.

A bit over a decade ago, it became the flavour of the age with gaming, too. From EA's Medal of Honor on, the bocage of France and the humble M1 Garand became as familiar to gamers as the corridors of that famous base on Phobos. But, like many good things, it got overused. Game after game delivered little new apart from re-hashes of levels and weapons we'd seen too many times before. True innovation in the setting seemed impossible.

Until World of Tanks, that is.

An MMO – kinda...

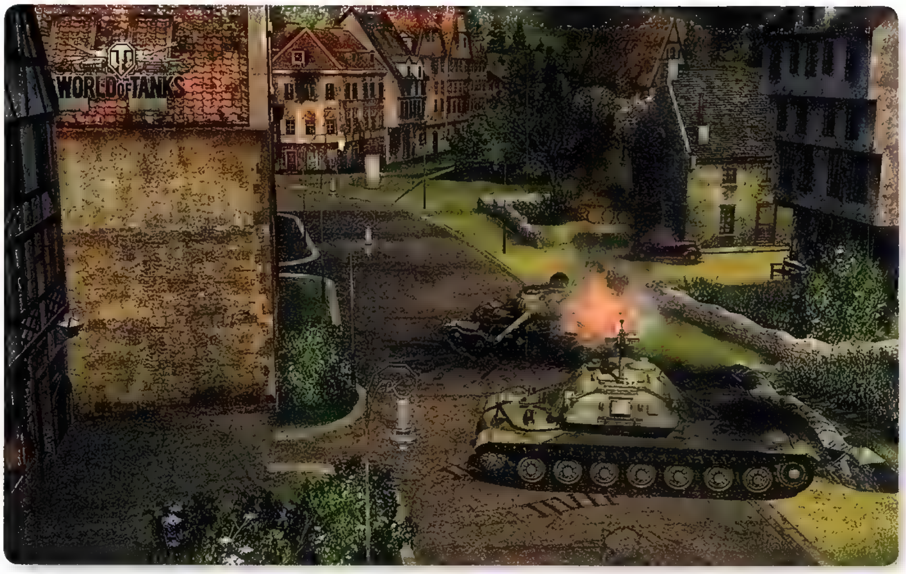
Wargaming.net, the gang behind what is – to be perfectly honest – our new favourite game, call World of Tanks an MMO, and they're kind of right. The problem is, when most people think MMO, they think World of Warcraft and classic fantasy RPG setup in a persistent world shared by many players. World of Tanks borrows some of those ideas, and it certainly features a massive amount of players, but really it's lot more like any large online FPS in its structure and the way games are set up.

The game's premise is deceptively simple – there's no story to play through, no quests to complete. Each game is simply fought between two teams of 15 players, as they each seek to dominate the other team's base or take out all its tanks, on one of a dozen or so maps that range from the fields of France to Egyptian deserts.

We say deceptively, because while those Quick Battles will be what you spend most of the time doing, the rest of the game is about earning XP, researching upgrades for your tank, and then unlocking new and better vehicles as you play. This is the classic RPG side of the game, as each tank can be fitted with a mix of suspension, engines, turrets, guns and more. With each game, you earn both XP (which can be spent on researching), and credits (which you spend on actually purchasing upgrades and equipment).

Even your crew advances, and when they reach a certain level of competency can be upgraded to certain specialty skills.

The progression from tank to tank follows a pretty complete tech tree for each nationality of American, German and Russian (British tanks are coming in a future patch). You start out in a tiny, 1930s era light tank, and then move onto your choice of self-propelled guns (SPGs), medium tanks, heavy tanks or tank destroyers. Each type



of tank is then broken up into better and better tiers, and the tanks themselves can sport up to a dozen upgrades each. You can choose to unlock everything on a particular hull, or simply focus on unlocking your next tank as soon as possible, depending on how you want to play.

Some of the choices, especially in weaponry, offer really different styles of play. Generally, if you're going to be playing with one particular tank for a while you'll upgrade every non-weapon component to its best possible option, but different weapons will often suit different play-styles.

And that great thing – all of this is available in a game which is free to play. You can purchase Gold, of course, which allows you to unlock a Premium account (that lets you earn XP faster, and unlocks features like Clans and voice chat), buy even better ammunition and other equipment, but even playing for free you never feel like Premium players have that huge an advantage. We ended up dropping money on the game purely because we want to support it.

Penetrating shot!

For all the tweaking and angsting over whether to mount a 75mm gun or 105mm gun on your Hetzer, the meat of the game is the actual combat. For all that its controls are quite simple, and familiar to any FPS player, the game's actually very deep in its modelling of tank-to-tank combat.

Each tank in World of Tanks is modelled accurately after its real-world counterpart, right down to speed, turret traverse rates, and armour thickness. The game's ballistics even model angle of attack and spotting distance, though the latter is abstracted somewhat to allow for vehicles with better optics and higher turrets to actually have an advantage. It's not perfect, but it does make for an interesting interlock between light tanks and artillery – when used correctly, a light scout tank can spot enemy vehicles for SPGs to rain down HE shells on. Medium tanks can then exploit the gap, giving time for heavier vehicles to move up into position. At the same time, tank destroyers can watch out for enemy counter attacks, or defend critical junctions. That, however, is just one example of tank tactics, and it's a credit to the developers that many real world tank tactics work perfectly in World of Tanks.

Graphically, the game's nothing to write home about, but it gets the job done. It's probably the one area where the game really shows its free to play roots. That said, there's destructible terrain, hit decals, a great view distance, some wonderful explosions and very little texture pop-in or stuttering.

It really is amazing that this game can be enjoyed as is for zero cost, and yet made even better by spending a few bucks. Premium accounts need to be regularly paid for, and we'll certainly be doing just that.

World of Tanks has done the near impossible and knocked Bad Company 2 off the Atomic default gaming roster. If that's not high praise for an out of nowhere game from an independent publisher, we don't know what is. **DH**

PC

Developer Wargaming.net
Publisher Wargaming.net
Website www.worldoftanks.com

Gameplay 96
Deceptively rich, very addictive, and a lot of fun.

Graphics 79
Not the best, but workmanlike and atmospheric.

Sound 78
Brilliant effects, but dodgy voicework.

Overall
A great game, at a great price.

91%

MOVIE

Source Code

Jake Gyllenhaal lives the same eight minutes over and over again, and we don't get bored. How can this be?

Director Duncan Jones
Writer Ben Ripley
Starring Jake Gyllenhaal, Vera Farmiga

There's a lot to both like and dislike about Source Code, and in some ways, it's a tough film to review without spoiling too much of the story.

The basic premise is both elegantly simple and frustratingly poorly-explained; a helicopter pilot wakes up in the body of a man on a train that's about to explode, and gets to live the last eight minutes of that man's life over and over again until he can figure out who's responsible for the explosion, in order to prevent a second attack later that day. There's some vague 'it's like when you turn a lightbulb off' hand-wavery about how this is possible, and a brief mention of quantum physics, but we would have liked more of any idea of what was actually at play. Was it memory? A sort of hypnosis? String theory? All we get is that this is definitely *not* time travel, which… well, we'll get to that.

While this isn't actually a one hander, there's no denying that it is Jake Gyllenhaal's film. Vera Farmiga certainly does well with her role as his handler and main contact, and the rest of the cast rise to the occasion – but given the occasion is 'one-dimensional support role', that's not saying much. Gyllenhaal, on the other hand, conveys just enough of whatever he needs to at any given moment to make you root for him, despite his dire situation. The inner conflict that his character feels is written all over his face, without any hamminess, and so his decisions feel as hard as they are. There's a tiny little moment quite early on, where his character is standing on a station platform, knowing the train in front of him is going to explode in a matter of minutes, and he realizes that he has to get back on and do his job, that had several people in the audience a little awed.

And this – and all of the tough decisions he makes – happens without any of the ra-ra-go-soldier-USA-USA theatrics that usually accompany such soldier-makes-a-sacrifice movie moment.

That said, if Source Code is a triumph of anything – in a moviemaking sense – it is a triumph of pacing.

The story of a man who has to relive the same eight minutes over and over again could very easily have turned into Groundhog Train – a repetitive, tedious mess of a movie. It's to the credit of director Duncan Jones (the man behind cult classic Moon) and writer Ben Ripley that just at the point where the more impatient members of the audience start wondering how many more times they can sit through this same sequence, they decide to first play on that repetition and then steer the film away from it. Giving Gylenhaal's character an awareness of the more repetitive elements of the story brings a little levity to what is otherwise a fairly bleak outing, while also giving voice to the concerns of the audience and assuring us that yes, we may have seen this before, and, yes, we may see it again, but things would move along soon.

At a smidge over hour and a half, Source Code is rather short – and feels it – but it never gets dull, and to us, short and snappy wins over long and tedious every day of the week. Jones and Ripley seem to know exactly when to pull back from their main trope, and how to do so without losing the momentum of the plot.

Unfortunately, what they don't seem to grasp as well, is how to best get themselves out of the corner the entire premise of the movie paints them into. There were several ways Source Code could end – but, and we're trying really hard not to give anything away, it feels like they went with the least interesting, most 'Hollywood' one; favouring sentimentality over sensibility, simplicity over complexity and, ultimately, leaving themselves in a big time-travel-paradox-shaped hole. Which, given that we were told so emphatically that this was not a time-travel film, is more than a little disappointing. **EG**

Overall
A crackingly-paced, if lightly plotted, flick let down by a crappy ending.

80%

CULTURE SHORTS

It looks like the planned reboot of Akira might be dead in the water, with news that Keanu Reeves will not be involved. Response to the news was mixed, but as one Atomican posted on our site: 'thank the gods for that!!!'

Faring better, miraculously, is TV's Chuck. The show has managed to somehow wrangle itself a fifth season, despite ratings that could generously be described as 'terrible'. We've got a soft spot for the reluctant spy and his merry band of handlers, so we're pleased, but confess to being relieved that this has been announced as the very last reprieve. We can't keep going through this every six months...

David E. Kelly's Wonder Woman project has been drawing criticism for months, and yet it's failure to launch has still come as a huge surprise to many. Maybe now someone better will take on the star-spangled onesie!

WE'RE NOT IN AZEROTH ANYMORE

"If any MMO is capable of beating Blizzard at its own game, it's this one."
8/10 PC Powerplay

"If you haven't been playing, what is wrong with you? It's great fun."
Games.on.net (Internode)

"Amazing and fun MMO experience."
9/10 Impulse Gamer

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atomic REVOLVER

You came, we talked, and AMD, Asus, Coolermaster and Razer all provided the hot tech - and hotter prizes!

Well, I think I can say that the University of New South Wales' Roundhouse has never seen anything quite like that. Rockstars? Sure. Drunken students? Yeah, you bet. (*Drunken rockstars too. Trust me. – subed*).

Atomicans and some of the best hardware in the world in full flight? That's gotta be a first.

It was a great night, enjoyed by everyone there. We loved it, the vendors loved it, and it certainly looked like you guys loved it. From the moment we opened the doors the buzz was awesome – in fact, we were worried that things were going to peak too early! But it just got better.

After a short introduction of how the event was

going to work, we split attendants up by colours so they could progress around the stands. We had ASUS covering off on video cards, motherboards and displays; Coolermaster had some really sexy cases on show, including a limited run Nvidia-green 690, and a really sweet all-white case; Razer was letting folks get hands on with the new Onza controller; and, finally, AMD had great set-up that included live international crosses to one of their engineers, and even a racing sim setup.

Hell, AMD was giving out two random CPUs to every group! No wonder they had such a huge crowd!

In fact, everyone had great prizes to give away, from cases to GPUs to Onza controllers to... yes, we even had thongs. Why, oh why do we always have some strange footwear for me to throw at people!

But, we had enough beer on hand to make it fun for all concerned.

Thank you all, sponsors and attendees alike, for making it a great night. We've already been asked by a mess of the sponsors when the next one is, so keep an eye peeled. And speaking of that, check out our giant gallery from the night – you might just find yourself...

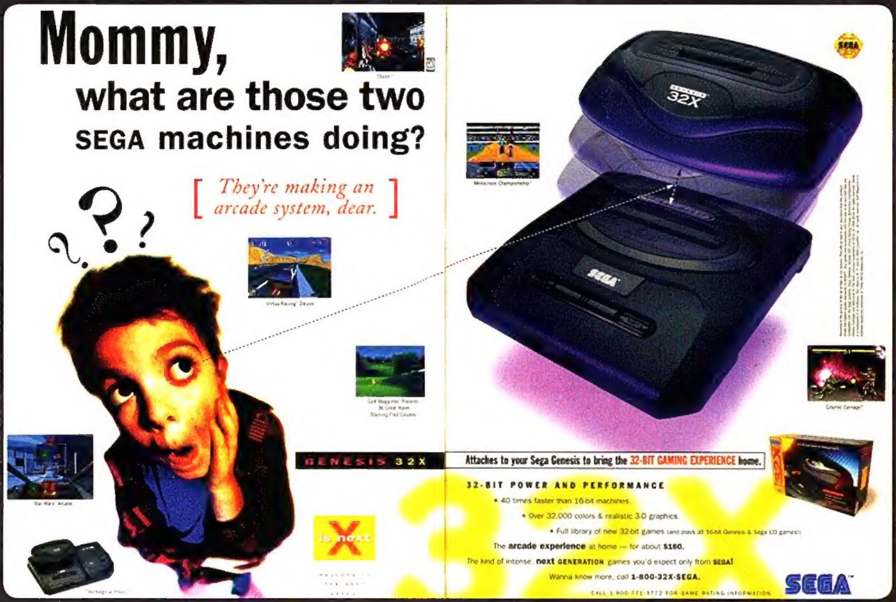
"Mommy, what are those two SEGA machines doing?"

Today's Console Wars history lesson with **Ben Mansill** looks at why 16 + 16 does not equal 32.

There was an ad for the 32x with the same quote as the title on this page. One of gaming's great ads, in fact. A young lad is awkwardly alarmed to see the 32x insert itself in a Mega Drive. My oh my. Risque but cute'n'clever. Looking back at gaming history and the great Console Wars in a bigger perspective, it is quite clear that Sega was indeed fucking itself.

1994 was an incredibly exciting time for console gamers. It was all about bits you see, and '94 was the leap to 32-bit. Not that anybody actually understood what bits actually were, beyond the ubiquitous explanation: "It's like having more lanes on a highway. The chip has more lanes." To which we all nodded sagely, like we were far too expert to need such childish analogies, yet went forth anyway in the gaming press at the time repeating that over and over…

'Bits' held no tangible meaning until 16-bit came along. When the 16-bit machines arrived they heralded a mighty leap in graphics and complexity. Taking center stage were Mega Drive and SNES. And in the fringe corner, Neo Geo and TurboGrafx-16.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16-bit life was good, very good, and for many years we were content. Then, when word started coming of impending 32-bit systems we ate it up like hungry hippos. *If 16-bit games were twice as good as 8-bit games… then… [brain melts thinking about it].*

This was the Console Wars. It was all about the bits, who would have them first, and what magic they'd actually deliver.

It was a glorious, fantastic race. With almost nothing to go on, speculation about which 32-bit machine would be the best was insane. This was the Console Wars. It was all about the bits, who would have them first, and what magic they'd actually deliver. It was like being in a warp speed tunnel to a new world – you couldn't actually see what the destination was like, but the speedy blurry excitement of the journey was insanely wonderful.

SEGA wanted to be first. They all did, of course. We knew Saturn was coming, that was the one everyone felt would be the dominant console for years to come. Nintendo was waiting, playing its own game, as it does. The Ninty 64 wouldn't arrive until 1997.

Sony was coming like a thundering mounted samurai charging. How good would PlayStation be? How good would PlayStation be!

There were a couple of spoilers that crashed the 32-bit party early, potentially dampening the excitement with their failure. Atari pissed in its own pants with the Jaguar – claiming it to actually be a 64-bit system, and actually shipping it first – a year first, in 1993. But the Jag wasn't a 'real' 64-bit system; its highways were mostly 32 lanes. Furthermore, most of the few Jaguar games looked pretty crappy, crappy in a 'good for 16-bit but this can't seriously be 32-bit?' kinda way.

Amiga, blessed be thy name, evolved into the CD32 and hit the streets at the end of '93, but too few people took it seriously enough to buy it, and game developers looked the other way; it was, after all, just an Amiga with a CD drive.

3DO showed how good the bits could be. Ah ha! We realised, seeing properly impressive 3D for the first time on a console. Yes, we want this, but from the real players, thanks, the one's that won't crash and burn in a year.

Like SEGA. Can-do-no-wrong-SEGA. The cleverest company of them all was covering its bases it the most brilliant tactical move of the console wars.

As well as the major assault coming with Saturn, it was 32-bittifying the Mega Drive! 32X would be a magistical mushroom of plastic with proper 32-bit innards that you'd just plug into the Mega Drive! What a grandly clever idea. It promised its own games, which would be so much better than regular Mega Drive games. It also hinted that it would actually play old 16-bit games better. What a thing to have!

It pandered to budgets. Can't afford a proper next-gen 32-bit Big Mac? *No worries, can has 32-bit cheeseburger – just as good!*

It leveraged love for the Mega Drive and its vast libraries of games. *No cardboard box under the bed for you, my beloved Mega Drive, there's years in you, yet!*

Yet, 32x failed. Kids with money favoured going all out for a proper 32-bitter. It was one or the other. A scant library of games and a crappy port of Doom washed a bucket of cold water over any excitement. There was just too much else going on in the console wars, relegating the interesting 32X to bit player status.

It was a hardware rush job with abnormally high failure rates. More about the marketing than the games, 32x also drew attention away from the Saturn, confusing kids and the market, and ultimately, fucking itself.

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